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THE AMERICAN JOURNAL OF ROENTGENOLOGY

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FLUOROSCOPIC BRONCHOSCOPY*

BY G. W. GRIER, M.D., PITTSBURGH, PA.

THE use of the fluoroscope as an aid in the removal of foreign bodies, aspirated or swallowed, would upon first thought appear to be a factor of the first importance. As a matter of fact there are but few cases in which it is of any material assistance to the endoscopist. However, in those cases in which it is of assistance at all it is practically invaluable.

From the work which we have done in collaboration with Dr. Chevalier Jackson we believe that fluoroscopy is only indicated when the foreign body is located in a bronchus or other structure which is inaccessible to the bronchoscope. Under such circumstances a forceps can be projected beyond the end of the bronchoscope and the foreign body grasped and removed under the direction of the fluoroscopist. To do this satisfactorily we believe the fluoroscopy should be carried on in two planes at right angles to each other for two reasons: 1st. The only cases in which fluoroscopy in one plane can be relied upon are those in which the foreign body is located in a main trunk and in such cases the fluoroscope is rarely needed. 2nd. The removal of a foreign body from a bronchus without being able to see it is always a dangerous procedure as serious damage may be done, especially if a sharp point is caught in the bronchial wall. If the fluoroscopist is able to see the foreign body in two planes and also the manner in which it is being grasped by the forceps he is able to give the bronchoscopist valuable information as to the proper means of removal.

We have had several discouraging failures in the removal of foreign bodies by fluoroscopy in one plane and at the present time would not feel inclined to try such a procedure in a case in which a competent bronchoscopist had failed to find the foreign body after having had good radiographs. We might cite here two cases to illustrate. In one case a child of two years had aspirated an ordinary pin which had gone down into a small bronchus near the diaphragm. Under fluoroscopy in the antero-posterior direction alone the bronchoscope was passed down to within three quarters of an inch of the pin. At this point several bronchioles came off in different directions and as we were unable to say whether the pin was in front of or behind the end of the tube and as the bronchoscope could not be passed any further down it was not found.

The second case was an open safety pin in the stomach. Foreign bodies are very difficult to see in the stomach because of

*Read at the 16th Annual Meeting, American Roentgen Ray Society, Atlantic City, Sept. 25, 1915.

the manner in which the stomach walls fold over the end of the tube. In this case, although fluoroscopically the pin was at the end of the tube several times, it could not be found. At laparotomy immediately afterward the pin was found in the *jejunum posterior* to the stomach. Had this been fluoroscoped laterally also, we feel sure the pin could have been demonstrated posterior to the posterior wall of the stomach.

Fluoroscopy for foreign bodies is not a proceeding to be left to untrained assistants or technicians, as oftentimes the skill of the trained roentgenologist is taxed to the utmost to see and properly locate the object sought. An ordinary pin in the lung of a crying child is sometimes a very elusive thing to the aspiring fluoroscopist.

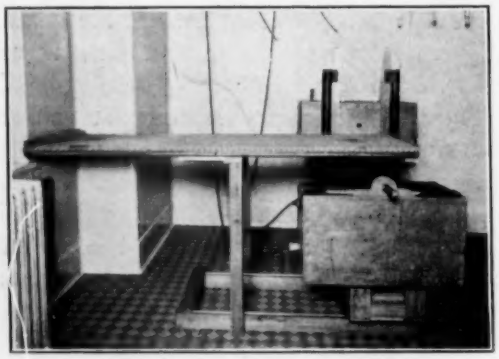

Fig. 1. Looking at apparatus from side.

The roentgenologist, or his confrere the endoscopist, may sometimes be tempted in a case in which the foreign body is seen unusually well by the fluoroscope to pass in a forceps and remove it without bothering to use the bronchoscope. This is particularly the case when the foreign body is in the upper end of the esophagus. Any one who has seen a case of acute esophagitis will hesitate before causing any unnecessary traumatism to this delicate structure. The author has seen such a case succumb after ineffectual attempts to remove a penny from the esophagus at the level of the sternoclavicular joint. We have also seen several fatal results following injury to the bronchi from the forcible removal of foreign bodies with and without the use of the bronchoscope.

Because of the fact that the fluoroscopic observations must be made by a roentgenologist and not by a chance observer, the apparatus must be made as safe as possible. Our first attempt to fluoroscope in two directions without moving the patient (the patient cannot be turned upon the side after the bronchoscope is introduced) was done with an ordinary tube stand placed at the side of the trochoscope. The tube stand

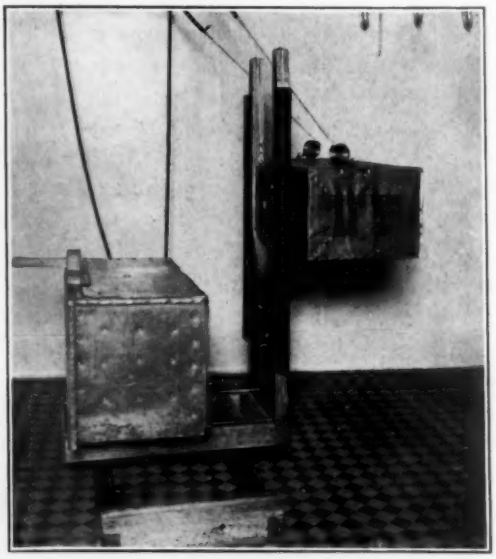

Fig. 2. Looking at apparatus from the rear.

was used for the lateral view, the trochoscope for the antero-posterior. This proved unsatisfactory for several reasons. We did not feel safe with it, the legs of the stand short-circuited the high tension feed wire of the trochoscope and, what was worse than anything else, an extra assistant was necessary to handle the tube stand. The patient was a child, no anesthetic was given and he squirmed around on the table so much that every time we wanted to make an observation in the lateral view the foreign body was out of the field of vision and the tube stand had to be moved. We also had a great deal of trouble because the tube box in the trochoscope did not come near enough to the end of the table, as the bronchoscopist

works with the patient's head over the end of the table.

We therefore constructed a special trochoscope having only one pair of legs, situated at the middle, the end of the top being fastened to the wall. To carry the tube box a frame carrying a pair of tracks parallel with the length of the table was laid on the floor beneath the outer end of the table. A subframe, whose length is placed at right angles to this frame, travels on the tracks on wheels. The subframe in turn has tracks on which the tube-box itself travels crosswise of the table. The tube-box can be brought out beyond the end of the table. To the subframe is fastened a pair of uprights, which are grooved on their opposing surfaces. A lead-lined board slides up and down in this groove like a window sash in the frame. A second tube-box is fastened to the back of this board and the whole thing is counterweighted.

The second tube-box, of course, moves lengthwise of the table when the subframe is moved. That is, both tubes move lengthwise of the table together. The crosswise adjustment of the first tube and the up and down motion of the second tube are independent to each other. Both tube-boxes are properly protected with lead and the fluoroscopes used are covered with lead glass.

In operation the light is shifted from one tube to the other in a moment by means of a string attached to a high tension switch and held in the hand. A double foot switch is used to give a weak or strong current as needed. In the lateral view a strong current is sometimes necessary.

We have used this apparatus several times successfully and with considerable comfort and peace of mind. In conclusion we would again lay emphasis upon the following points:

1st. Fluoroscopic bronchoscopy is only indicated in those cases where the foreign body cannot be located by visual bronchoscopy.

2nd. The fluoroscopy and the bronchoscopy should not be done by the same person.

3rd. On no account should the attempt be made to remove the foreign body by the fluoroscope alone without the aid of the bronchoscope.

4th. The fluoroscopist should be a competent roentgenologist.

5th. The protection of the fluoroscopist must be as perfect as possible.

The author wishes to express here his appreciation to Dr. Chevalier Jackson, whose masterful work in his chosen art has been our inspiration and guide.

8111 *Jenkins Arcade.*

DISCUSSION

Dr. GEORGE C. JOHNSTON, Pittsburgh: The construction of this apparatus represents a great deal of hard work, and there are several important features which will be appreciated by any one who ever attempted to do anything with a child while the bronchoscopist is at work. In addition to a number of useful assistants there is usually a large audience. You are working in the dark and yet certain rules must be considered. To work with an ordinary trochoscope is an impossibility. It took quite a good deal of thought to work this out, and provide some way in which we could have the patient on the table with the head and shoulders off the table. That is what all these devices are for. The two tubes travel up and down the length of the table synchronously. It is necessary to indicate to the bronchoscopist whether he is above or below, in front of or behind the foreign body. The apparatus is crude, but it has the special advantage that it works all the time.

RADIOGRAPHIC DIAGNOSIS OF METASTATIC PULMONARY MALIGNANCY

A REPORT OF SEVENTY-ONE POSITIVE CASES*

BY ALEXANDER B. MOORE, M.D., AND R. D. CARMAN, M.D.

MAYO CLINIC, ROCHESTER, MINN.

OUR object in presenting this paper is twofold: first, to impress on roentgenologists the typical appearance of metastatic malignancy in the lungs; second, to call the attention of surgeons and internists (a) to the relative frequency of the condition, (b) to the indefinite clinical pictures these cases present, and (c) to the high percentage of correct roentgenographic diagnoses that can be made. While roentgenologists have long recognized metastatic pulmonary malignancy as a definite entity, the literature is woefully deficient in any description of their work and the accuracy of the roentgenographic examination is unknown to many physicians.

Bristowe, as early as 1860, called attention to the fact that malignant conditions are prone to form metastases in the lungs, and stated that these areas were capable of secondary degeneration and infections, thereby simulating many pulmonary diseases. Warfield has reported a case of pulmonary metastasis from cancer of the breast on which he performed an autopsy. He gives an interesting review of the literature and says that while in most text books the condition is described as rare, it is in reality far from uncommon and that at least one-third of all patients dying from cancer of the breast have metastasis in the lungs. He further quotes from the report of cases of the Middlesex Hospital in which metastases were found in the lungs in 178 out of 516 autopsies performed on persons who had died from cancer of the breast. In his discussion, Warfield calls attention to the relatively good general condition of the patient and emphasizes the indefinite character of the signs and symptoms. He believes that an ante-mortem diagnosis cannot be made in a large percentage of these cases.

This report is based on a series of 71 positive cases examined at the Mayo Clinic by both clinical and radiographic methods and in which the combined findings have been tabulated. The two examinations have been conducted independently and in a majority of instances the radiographer had no knowledge of either the clinical history or findings until after his report had been presented.

There were 39 women and 32 men in this series. The average age was 45½ years. The average time since the primary growth was noticed was two years and three months. The distribution of the primary focus was as follows: The breast; thyroid; kidney; soft tissues of the hand, arm, shoulder, leg and thigh; neck; the face; hard palate; adrenal; lung; larynx; esophagus; uterus; prostate; testicle; sigmoid and in abdominal and pelvic masses the exact nature of which could not be determined. In four of these cases the seat of the primary lesion was not discovered. While the most common primary focus was the breast, this being the primary seat of the malignancy in twenty cases, when one considers the large percentage of cancers that are situated in the breast it would seem that malignancies probably have no greater tendency to form metastases in the lungs from this focus than from foci situated elsewhere. This point, however, is still under investigation.

In the eight cases in which the primary focus was localized in the thyroid, there was

* Read before the American Roentgen Ray Society, 16th Annual Meeting, Atlantic City, Sept. 22-25, 1915.

FIG. 1 (136890). Two large areas of metastasis in right lung, secondary to sarcoma of the pelvis.

FIG. 2 (136890). Same as Fig. 1. Roentgenogram made 35 days later.

FIG. 3 (81323). Two small malignant nodules in the upper right lobe, secondary to carcinoma of the breast.

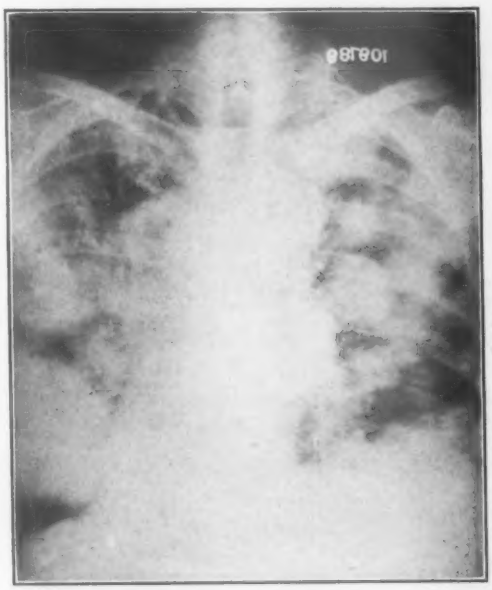

FIG. 4 (109789). Extensive areas of metastasis in both lungs, secondary to an abdominal carcinoma probably primary in the stomach.

FIG. 5 (96087). Multiple areas of metastasis in both lungs, secondary to carcinoma of the cervix.

clinically a higher degree of dyspnea than in the others. This, of course, is explained by the pressure of the thyroid from above; in but one of these cases was the thyroid of the intrathoracic type. In the cancers of the thyroid it has been practically impossible to determine the duration of the primary malignancy, the enlarged thyroid usually having existed for years.

In eleven cases the primary focus was in the soft tissues of the forearm and shoulder, and the leg and thigh. Of these, ten were sarcoma and one epithelioma; only six of these showed any enlargement of the axillary or inguinal glands.

Of the five cases in which there was metastasis from the kidney, three had been operated on and two showed large renal masses with a definite unilateral hematuria; in one the tumor was demonstrated by the pyelogram. Of the cases operated on, two were "hypernephroma" and one carcinoma.

In five of the cases the primary focus originated in the soft tissues of the neck and face; three were sarcoma and two epithelioma (one lip and one cheek). According to the literature, it seems quite unusual for malignant lesions above the clavicle to produce metastases in the trunk. Our experience tends to confirm this since these five cases form a very small percentage of the total number examined; however, the primary lesions were not nearly so extensive as in many cases that did not show metastases.

The two cases originating in the uterus were both cancers; one from a small lesion of short duration in the cervix, without enlarged glands. The uterus was freely movable and the patient apparently in splendid condition. The other was secondary to a degenerated myoma that had been removed six months before. This latter case was complicated by a pleural effusion and the patient was in extremis.

In two of the cases the origin was in the esophagus. Neither presented any unusual radiographic features; extreme prostration due to their inability to take food was the most marked clinical characteristic.

The primary focus was in the prostate in two cases and in the testicle in two. The two in the prostate were carcinoma and one showed metastases in the pelvic bones. Those originating in the testes were sarcoma; both had been operated on and neither had any local recurrence.

There was one case originating in the hard palate, one in the larynx, one in the adrenal and one in the sigmoid; all of these were carcinomas presenting no unusual features.

One case, apparently both from clinical and roentgenologic standpoints, originated in the lung. The clinical history and findings as to the primary growth were very definite, and the radiologic evidence of the metastases was beyond question.

In fifty-nine of the series we were able to obtain pathologic reports as to the nature of the growth. Many patients brought reports from other laboratories and in others either a gland or a piece of tissue from the primary growth was removed for microscopic examination. These specimens were classified pathologically as 40 carcinomas, 16 sarcomas and 3 "hypernephromas."

Seven autopsies were performed in this series of cases, four in our laboratories and three elsewhere. The small percentage of autopsies is explained by the fact that most of the patients remained in the clinic but a few days and, while in many instances the family physician was requested to obtain permission for an autopsy, very few were performed.

LOCATION OF PRIMARY FOCUS IN CASES SHOWING RADIOGRAPHIC EVIDENCE OF METASTASES IN THE LUNGS

Total number tabulated	71	cases
Breast	20	"
Thyroid	8	"
Kidney	5	"
Soft tissues of forearm and shoulder	6	"
Soft tissues of leg and thigh	6	"
Soft tissues of neck and face	5	"
Uterus	2	"
Esophagus	2	"
Prostate	2	"
Testicle	2	"
Hard palate	1	"
Larynx	1	"
Sigmoid	1	"
Adrenal	1	"
Lung	1	"
Abdominal and pelvic masses	4	"
Origin not determined	4	"
	71	cases
Men	32	"
Women	39	"
Average age	45.5	years
Average time since growth was noted	2¼	"
Histologic examination	59	cases
Carcinomas		40
Sarcomas		16
Hypernephromas		3
Enlargement of superficial glands	35	cases
Enlargement of deep glands	8	"
Other foci of metastasis	14	"

Glandular Enlargement.—Thirty-five of these patients showed some palpable enlargement of the superficial glands, and eight showed enlargement of the deep glands.

Extent of Primary Growth.—Apparently no idea as to the presence of pulmonary metastasis can be gained from the extent of the primary growth. Many cases with extensive involvement showed no metastasis, while in many of the cases included in this report the primary growth was small and clearly operable except for the radiologic evidence of metastasis.

Other Foci of Metastasis.—Fourteen of these cases showed metastasis in organs other than the lungs or lymph nodes. The other organs most frequently involved were the liver, bones and brain.

Patients Operated on.—Forty-two of these patients had been subjected to surgical procedure for the removal of the primary growth; of these 19 showed local recurrence. The average time from the operation to the discovery of the metastases was 15 months.

Symptoms.—Cough was the most common symptom noted, being present in 32 of the 71 cases. The character of the cough was usually dry hacking and in many cases was little more than would be expected in patients of the cancer-age. It was usually unproductive, expectoration having been noted in but eight of these cases. Hemoptysis was rare, but four of these patients giving any history of blood-spitting. The so-called prune-juice sputum, regarded by some observers as indicative of this condition, was noted in none of our cases.

Dyspnea.—The next symptom in order of frequency was dyspnea; this occurred in 30 of our cases. The dyspnea was usually progressive and, when marked, tended to be spasmodic in character, quite often simulating asthma.

Pain.—Pain referred to the thorax was noted in 14 instances. This pain was usually described by the patient as a gnawing one and was not influenced by respiration.

Temperature.—But four of these patients showed an increase in temperature at any time, and none of them gave a history of night sweats.

Fluid.—There was both clinical and radiographic evidence of pleural effusion in 12 of the cases, and in 10 the effusion was tinged with blood when aspirated.

Physical Findings.—A very striking feature was the relative absence of definite physical findings. But sixteen of the patients presented signs that could be construed as indicative of pulmonary metastasis; of these sixteen, twelve, as mentioned above, had pleuritic effusions.

Loss of Weight.—Loss of weight was not marked; in fact, the most striking feature in reviewing this series was the relatively good condition and healthy appearance of most of the patients save for the anemia which was no more marked than in any other patient suffering from a malignant lesion.

If the above tabulation can be regarded as indicative, the clinical picture of pulmonary metastasis is indeed an indefinite one, the most common symptom—cough—being present in less than 50 per cent. of the cases. No idea as to their existence can be obtained from the extent of the primary lesion or the presence or absence of glandular involvement. Only by routine radiographic examination in cases of malignancy will the diagnosis be made in the majority of these cases.

Radiologic Appearance.—In the roentgenologic examination of the thorax in suspected cases of metastatic pulmonary malignancy, as in all cases examined where a study of the intrathoracic viscera is desired, the plates should be made and studied stereoscopically, and great care and conservatism should be exercised in following out details of the examination. In our work the plates have been made routinely by the stereoscopic method, the patient, in the upright posture, facing the plate, the tube shifted parallel to the spine. If necessary, a second pair with the back to the plate may be made. Some have been studied by the fluoroscope as well, but only in those cases complicated by pleural involvement has any additional information been obtained by this means.

The roentgenologic appearance of metastatic malignancy is quite typical and consists in the localization of clear-cut circumscribed areas of increased density, varying in size, in our experience, from the head of a small hat-pin to that of an orange. Their density varies from a faint shading to a degree approximately equal to that of the heart, depending on the stage of the disease. These areas are usually multiple, are found most commonly near the hilus and are usually situated nearer the base than the apices of the pulmonary lobes. Roentgenologically, they may be differentiated from inflammatory areas of increased density by the clear-cut line of demarcation that separates them from the surrounding tissues, in sharp contrast to the so-called "fimbriated halo" found in inflammatory conditions. No idea as to cellular structure can be obtained from the roentgenogram, all forms of malignant tumors apparently giving the same appearance in the roentgenogram.

Differentiated Diagnosis.—Roentgenologically, the most common conditions that must be differentiated from metastasis are: tuberculosis, syphilis and cysts, particularly hydatids. Tuberculosis can usually be excluded by the lack of any clear-cut line of separation from the surrounding parts, by the mottling that is so well known to us all, by the smaller size of the areas of increased density, and by their tendency to cavitation.

Syphilis.—Syphilis, according to Virchow, occurs in the lungs in two forms: namely, interstitial infiltration and gumma. He states emphatically that coarse gumma is never seen without a surrounding infiltration. Rothschild states that syphilis is shown in the roentgenogram as a diffuse shadow; this should be a distinguishing feature. However, we have seen no proved cases of pulmonary gumma. Most observers agree that syphilis in the lungs is very rare. Osler reports but 12 cases out of 2,500 autopsies and the Massachusetts General Hospital reports no cases in 3,000 autopsies. In our cases the possibility of syphilis was always excluded by the Wassermann test.

Cysts.—Cysts may usually be differentiated by their greater size and density. A large percentage of cysts of the lung are hydatids and are usually located in the right lower lobe; most of them are secondary to cysts of the liver and gain entrance to the lungs by penetrating the diaphragm.

Roentgenographically, 60 of our 71 cases showed multiple nodules and 11 showed

single nodules. One of the most striking features was the relative absence of any increase in the mediastinal shadow, only 27 showing any increase at all over the normal. This would tend to confirm the observation that these metastases are embolic and travel through the blood rather than the lymph streams.

A positive roentgenographic diagnosis of metastatic pulmonary malignancy was made in 58 of our series, in 12 a slightly modified report and in 1 case a negative report. In this latter case, through an error in interpretation, the nodule was not discovered until a second examination was made.

CONCLUSIONS

From the above study the following conclusions may be drawn:

1. Pulmonary metastatic malignancy is not an uncommon condition and may occur regardless of the seat of primary focus.
2. Pulmonary metastasis bears no relationship to the extent or duration of the primary focus.
3. The clinical picture in a majority of these cases is very indefinite, neither the subjective nor the objective manifestations being characteristic of the condition.
4. Metastatic pulmonary malignancy is a definite roentgenographic entity, appearing in the roentgenogram as clear-cut circumscribed areas of increased density.
5. In many instances the diagnosis can be established only by the roentgenogram. By routine roentgenographic examination of the thorax many patients suffering from malignancy will be saved from useless and unwarranted surgery.

ROENTGENOGRAPHIC DIAGNOSIS OF PULMONARY TUBERCULOSIS

BY KENNON DUNHAM, M.D.

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IN 1910 I presented before this society a preliminary report of my stereoscopic chest work. This included a description of the technical means by which a roentgenogram of the chest could be seen in accurate perspective.

I then described the normal chest markings as seen upon such stereoscopic plates and called special attention to the trunks and linear markings and their location.

Up to this report there had been great dispute as to which anatomical structures caused these increased densities.

I then described the characteristic variations from these normal markings, which were peculiar to tuberculosis.

However, the explanation of the characteristic tuberculous changes rested upon an empirical basis. Sufficient knowledge of the pathological anatomy of tuberculosis was not then at hand to explain these markings.

To-day I present a preliminary report of the continuous work of the last five years, culminating in this summer's work done in conjunction with Dr. W. S. Miller, at the University of Wisconsin. In this report I wish to emphasize the importance of my previous observations, also to amplify my deductions as to the anatomical structures underlying the normal chest markings, and to further show the character and location of the lesions which cause characteristic tuberculous markings upon the stereoscopic roentgen plates. In addition, I present for your consideration a valuable prognostic sign in tuberculosis. But the deduction that I can make from all this work, that is of the greatest importance to you

x-ray men is its emphasis on the *x*-ray as a most valuable means of studying pathological lesions. By its aid I have been able to connect the studies made of the gross and the microscopical pathological anatomy of pulmonary tuberculosis and thus to comprehend the work done in each of these fields.

I have pointed out to you that the anatomical structures underlying the treelike shadows in the chest plates are the artery, the bronchus, the vein, the lymphatics, and their connective tissue. To-day I wish to amplify this by showing that the artery and the bronchus extend from the lung roots to the periphery of the lung in such close proximity as to often overlap each other. Each of these has its accompanying lymphatics. A larger vein follows each main bronchus, but does not lie so close to it as does the artery, but the collateral veins lie as far from the collateral bronchi as possible, whereas the arteries follow all the branchings of the bronchial tree. Should it become possible so to develop our *x*-ray technic as to be able to show these collateral veins as you see them in my slide of the hog's lung, I believe that then the last step in the technic of *x*-ray diagnosis of pulmonary tuberculosis will have been taken.

The roentgen findings which I described as characteristic of tuberculosis, consisted of numerous abnormal changes limited to the linear markings of the various trunks. These have always reached the periphery, have been more or less fan-shaped, with the apex or the angle of the fan toward the hilus, and the plate markings of the densities of the lesions are not homogeneous, but each trunk has a distinct characteristic marking. So a plate showing homogeneous lesions is probably not of tuberculosis.

The problem therefore has been, "What causes these abnormal densities in the linear markings of the individual trunks, which are found in cases of tuberculosis, and where are they anatomically situated?" The following is purely a preliminary report. I found that they were due to tubercles and situated along the bronchial tree; that the trunks represented larger bronchi with their accompanying vessels, and the linear markings the branches of these. This research was prosecuted by means of serial sections of blocks, taken from lungs which had been so prepared as to enable me to take *x*-ray pictures of the lesions and remove that part for examination which showed the characteristic markings. We found these tubercles in the crotches of branching bronchus and vessel and extending not as continuous, but as separate tubercles throughout finer branchings of that particular bronchus or vessel. It was noted that these tubercles when quite small broke into the bronchus, forming minute microscopic cavities, and that the bronchus was the natural drainage tube of these cavities. Thus the spread of tuberculosis is, roughly speaking, along the bronchial branches, and until large areas are involved the lesion is evidently limited to this particular distribution by means of its natural drainage tube (the bronchus) and not by a fibrous wall. The subsequent spread of the disease does not extend from one small branch to its neighboring branch of another trunk, but goes back to and extends along another main trunk or main bronchus. This may be the adjoining trunk or another lower down.

The spread of tuberculosis throughout a lung is usually from the apex to the base, but not as a continuous extension. Frequently a large bronchus will be passed over without infection, and the apex of the lower lobe is often involved while a large part of the upper lobe may be free.

Thus by studying serial sections of carefully selected areas, we find that a model of the tubercles as they appear along the bronchus and blood-vessels would give a picture corresponding very closely to stereoscopic plates taken of patients having tuberculosis and taken of tuberculous lungs removed from the chest. Thus the arbeit is complete.

I have given the technic by which a chest can be seen accurately in relief; I have carefully described the markings of a normal chest plate; I have shown the anatomical

structures underlying these normal markings; I have pointed out the characteristic densities caused by tuberculous lesions; and I have shown what lesions these densities were due to and where they are anatomically located.

To this general statement I wish to add two deductions: first, that in the *x*-rays we have an excellent means of studying the fundamental principles of pathology. It accurately indicates abnormal density and when we learn where these densities are located and to what they are due we solve many pathological problems. When our ideas of pathological conditions will not explain the *x*-ray findings we have presented a valuable field for research. Second: the question is frequently asked, "Will the *x*-ray detect tuberculosis as early as the physical examination?" To this I wish to answer that the *x*-ray will often give us our first definite knowledge of the existence of tuberculosis—but that a diagnosis of tuberculosis is not of great value unless we can accompany that with a fairly accurate prognosis, and that nothing has ever been of such prognostic value as the roentgen findings, unless it be the physical condition of the patient. Three conditions argue for a bad prognosis—cavity, involvement of the bases if at all extensive, and laryngeal tuberculosis. Two of these are best determined by means of the roentgen ray. So that, in presenting my arbeit, which is the diagnosis of pulmonary tuberculosis by the *x*-ray, I have also emphasized its value in the study of pathological anatomy, and in the prognosis of pulmonary tuberculosis. I wish also to call your attention to the importance of the roentgen ray, as I have used it for the differential diagnosis of pulmonary tuberculosis from other pulmonary lesions.

DISCUSSION OF THE PAPERS OF DRS. DUNHAM, MOORE AND CARMAN

Dr. W. F. MANGES, Philadelphia: From the standpoint of roentgen diagnosis, this has been almost a neglected subject, and yet it is a most important one. Some years ago Dr. Dunham read a paper on the subject which perhaps some of us found difficult to appreciate because we had not done the painstaking work he has done. He comes now with but little variation in his results and deductions, but convinces us that he has really accomplished something. We must remember that we work with men who are very painstaking in their work, and who expect the same service from us. They should not be blamed because we did not have confidence in the early work in the roentgen diagnosis of tuberculosis.

We cannot expect to see these early small lesions in the lung except stereoscopically. It is not possible to localize them otherwise. The clinician is firmly convinced that the earliest possible means of diagnosis is by the reading of physical signs. He trusts his ear more than anything else. If he hears râles in the upper portion of the chest, he will find that there is a history of temperature, regardless of whether the patient has noticed it or not. He does not care so much whether he finds tubercle bacilli in the sputum. That is not so important to him as the fact that the patient has sought medical advice, that he, the clinician hears râles in the upper portion of the chest over the apices. He claims that the patient has tuberculosis, and treats him accordingly. That is the position held by many clinicians to-day, especially the younger men, who are specializing in tuberculosis. They do not believe that we can show the earliest lesions. I think that is largely because they have not seen Dunham's stereoscopic plates. It is not so much a tribute to Dunham as it is a fact which we must consider. Dunham has done a lot of work, and if we do not take it seriously we will remain the same haphazard diagnosticians of early pulmonary tubercu-

losis that we have always been. It is with difficulty that you can get the internist to permit a chest examination in a case where he suspects pulmonary tuberculosis. I have had such an experience in a large hospital in Philadelphia. I have asked the clinicians time and again to let me make a roentgen examination of the chest of patients whom they believe have early pulmonary tuberculosis. I have been permitted to examine a few, and most of them have shown most advanced lesions in the chest.

Within the last week I saw a written report addressed to a surgeon, advising a young man to submit to an operation for gastric ulcer. He had spat blood; he had pain in the abdomen, and all the other clinical evidences of gastric ulcer of some years' standing. "It not only disturbed his peace of mind, but interfered with his earning capacity." Therefore, an operation was advised. He was first referred to me, however, for an examination of his stomach. I found that organ to be normal, so far as we can judge normal stomachs by means of the roentgen ray. I made stereoscopic plates of his chest, and found both lung apices densely infiltrated, beyond question the result of an old lesion, with little isolated shadows throughout both lungs. The clinician's report stated that there was slight thickening of the left pleura, but no evidence of pulmonary involvement. I do not mean to say that that patient had an active tuberculosis. I simply claim that I found certain shadows which indicated old lesions and others which indicated recent lesions.

The paper by Moore and Carman is a most convincing one. It emphasizes the necessity for more thorough routine examinations. Surgeons should insist on having all of their cancer cases examined in this way before operation, as well as after operation. If these metastatic nodules are found in the lung, it is obviously useless to operate for a cancer of the breast. I treated a lady for a recurrent carcinoma, beginning seven years ago, for a number of years. She apparently recovered her health. Later she had an ovarian cyst removed, submitted to an operation for appendicitis, then worked on a farm. She came to the hospital last January, complaining of shortness of breath. She had a pleural effusion on one side, and a distinct metastatic nodule on the other. I immediately began roentgen treatment again, and she did very well, being relieved of all her symptoms. The thickening at the base of the left lung has not disappeared. I finally discharged her because I felt that I had given her enough treatment, so much, in fact, that it was advisable to let her rest a while and have the skin over the chest get well from reaction to *x*-rays.

Dr. L. G. COLE, New York City: Dr. Dunham has done remarkable work. His stereoroentgenograms of the chest are wonderful, but I cannot refrain from making a few statements which comparatively few men in the audience will recall. One or two personal instances are probably unknown. In 1907, after three years of work with eminent physicians in New York, I presented a paper to this Society. I was fortunate in having a few good plates which were greatly appreciated. That paper was published in the Transactions of this Society, and also in the *American Journal of the Medical Sciences*. In it I considered the question of the roentgen diagnosis of tuberculosis and the classification of the lesions. It was felt at that time by some that to publish such an article would do harm. Since then Dunham has taken up this work, and has confirmed everything I said in 1907. The only new thing he added is the fact that tubercles are present along the branches.

Dr. GEORGE E. PFAHLER, Philadelphia: If you will look over the records of this Society, you will find that a number of men have contributed papers on this subject. My first paper was published in 1905. I want to speak particularly, however, on the diagnosis of pulmonary carcinoma, a subject that should receive more attention. I agree with Dr. Manges that it would be well for the surgeon to have every case of carcinoma examined with the roentgen ray, especially

those cases in which there is some glandular metastasis, before operation. Dr. Rodman and Dr. Laplace refer their patients to me before they operate, to have me determine whether there is pulmonary involvement. Usually, when cases are referred to me for post-operative treatment, I make an examination of the chest. In many of them I find evidence of pulmonary disease. Dr. Moore unfortunately hurried over that subject somewhat. I would like to have more information as to just what are the early signs of pulmonary carcinoma. I think they resemble those of tuberculosis. Sarcoma is different. Most of the pictures Dr. Moore showed us were those of sarcoma cases. The nodules have definite outlines, so that one can make a definite diagnosis, but that would not be true of pulmonary cancer. I have seen a number of cases where I could not differentiate between carcinoma and tubercle. Eight or ten years ago I made diagnoses of tuberculosis, but by following these patients and making subsequent examinations I became convinced that they were cases of carcinoma. In two or three instances a necropsy was performed. The majority began with a thickening around the base and dense masses just above the liver, so that it was difficult to distinguish the liver margin. There are cases where the lesions develop around the apices and roots of the lungs just like tuberculosis. I am sure that in many cases we cannot make a diagnosis. In many of the carcinoma metastases in the lung the lesions are more marked on the side from which the breast has been amputated. Of course, there is not so much cavity formation, but there is that appearance seen early in tuberculous patients—a sort of infiltration. The clinical history helps much to arrive at a probable diagnosis, but it cannot be made with the same definiteness as a diagnosis of tuberculosis of the lung.

Dr. RUSSELL H. BOGGS, Pittsburgh: I would like to know whether metastases are found in the lung in cases of scirrhous carcinoma. I have examined a few cases of carcinomatosis originating in bone, the metastases appearing in the lung. They were all scirrhous cancers.

Dr. P. M. HICKEY, Detroit, Mich.: I would like to call attention to one point in the diagnosis of carcinoma of the lung, and that is the tendency of a line, as it were, to extend across the lower part of the left lung. That is due to an infiltration between the middle and the lower lobe. Whenever you find a well-defined line extending across that way, you can at least be suspicious of malignancy. It is not an infallible sign, but it is very suggestive. In the consideration of appearances on the plate after a carcinoma of the breast we should remember that the first infiltration usually appears in the pleura. If you look at some of these cases at autopsy, you will find little nodules on the parietal pleura, extending along in rows. They look like little drops of wax. They cast very characteristic shadows which need to be studied stereoscopically.

Dr. S. D. CHILDS, Denver: This work has been done most excellently and thoroughly. The conclusions drawn seem warranted, and the majority of them can be demonstrated post-mortem. The important part, the really valuable part, of the roentgen examination of the lungs I think is being overlooked by many men engaged in this line of work. Dr. Rodman told us in his address that if we are really going to cure cancer we must get at it early. That is also true of tuberculosis. We in the West probably see as much, if not more, of tuberculosis than is seen in any other part of the country, and we know that too often patients are sent West without a diagnosis of tuberculosis, or the disease has advanced so far that the patient's chance of recovery is greatly diminished. The early lesions of tuberculosis can be detected on the roentgenogram. A little indistinct haze or spot of increased density about the root of the lung can be detected with the roentgen ray before a clinical examination will reveal them. Of course, we cannot prove that we are right absolutely unless the case progresses and

finally is found to be frankly tuberculous. If we would spend more time in studying roentgenograms of normal lungs, so as to fix the picture in our minds, we would more easily and more quickly detect anything that was not normal. If we can make the diagnosis early, if we can convince the clinician that we can do this, we will not only confer great benefit by prolonging life, but we will also place the roentgenologist on the basis of a consultant.

Dr. H. W. DACHTLER, Toledo: In cases where the clinical examination does not reveal any evidence of tuberculosis and the roentgenogram is negative, a Wassermann test should be made. It may explain the case. For several years we have made it a practice of roentgenographing all chest cases after operation, before we dismiss the patient. I find it to be of considerable value in checking up the plates made later on, when the patients come back with a recurrence. Dr. Hickey is correct in his statement. I have heard some criticism of that infiltration along the visceral pleura, but if you take into consideration the findings in a chest, if negative to tuberculosis, you will find that that is a definite showing in these cases. The base of the triangle will be toward the hilus of the lung. I have been able to diagnose a malignant condition of the chest in about a dozen cases. The cases that are dangerous are those with axillary involvement. I hoped that Dr. Dunham would tell us something about the direction of the infection in his cases of tuberculosis. It was once thought that this was always out along the peribronchial chain of glands, but I am not so certain about that now. It is quite a debatable question, because it is at variance with other modes of infection, which follow the lymph stream. I have seen cases in the last two years in which there were definite tubercles near the axillary region, with no evidence of infection in the hilus. A few years ago a pathologist in Prague told me he was always able to find infection at the periphery of the lung, if he could demonstrate a tuberculous condition in the hilus. I think you will find that many of these cases have an infection at the edge of the lung, and that it travels along the lymph stream into the root of the lung.

Dr. JAMES T. CASE, Battle Creek, Mich.: I have seen a case in which a diagnosis of metastatic carcinoma of the lung was made on the finding of a small, round shadow at the level of the fifth interspace, similar to those shown by Dr. Moore. Only one plate had been made. I made stereoscopic plates and showed that this shadow was the nipple shadow. This might be a source of error in the hands of one not familiar with this work, especially if the work is not done stereoscopically. It has been our custom for several years to make a stereoscopic chest examination of every patient who is to be operated on for carcinoma of the breast. This is done not only to be forewarned as to the presence of metastases in the lung, but also as a matter of record for future comparison if the patient should return with symptoms suggesting metastatic involvement.

Dr. D. R. BOWEN, Philadelphia: I had a case which coincides with one of the statements made by Dr. Moore. The patient was an Italian boy who had been operated for sarcoma of the forearm. He had a recurrence which was treated by the roentgen ray with apparent recovery, but the patient remained in the hospital as a helper.

Though he was of the sort who complain for every cause and often for no cause, he made no complaint about his chest until there were very large metastases in both lungs, as shown by roentgen-ray examination.

Dr. A. W. CRANE, Kalamazoo, Mich.: Dr. Cole has called attention to his early work on pulmonary tuberculosis, and Dr. Pfahler mentioned the date of his contribution to the subject. I wish with equal modesty to call attention to a paper which I wrote on the subject of pulmonary tuberculosis, one which was not published in the archives of this Society or even read here, because it was written before the Society

was organized. It did, however, receive approval abroad, and on the strength of that paper I was made a member of the London Roentgen Society.

Dr. KENNON DUNHAM: I do not claim priority in studying lesions of pulmonary tuberculosis by means of the roentgen ray, nor in the use of stereoscopic plates.

I do claim priority for my reading of stereoscopic plates of chests, which I believe is accurate and which does distinguish tuberculosis. Further I know that these plate markings have a pathological basis which has not been generally recognized, and that a careful study of such plates must lead to a clearer diagnosis, because through them we can better understand the underlying pathology. Knowing this we can better direct the life and treatment of our patients.

To properly understand our plates it is necessary to approach them from a scientific point of view. They are records of density. They do not show tubercules, connective tissue, etc., and to speak of them as showing such is an unscientific assumption. When I began to study I was so anxious to avoid reading too much into these plates that I tried to forget anatomy and pathology and carefully avoided looking them up until I could clearly describe the characteristic densities which were produced by the tuberculous chest. Since then I have made every effort to study the anatomy of the lungs and the pathology of pulmonary tuberculosis, and I am proud to say that this research corroborates the plate markings which I have previously described.

This is the first paper in which I have used the word tubercle when speaking of a given density. And I only do this now because after a careful study of serial sections I have proven what these densities do represent.

This is in direct contrast to Dr. Cole. He wrote much of the tubercle and the conglomerate tubercle. He showed the disease to advance or recede as these conglomerate areas increased or diminished. His classification follows Delafield and Prudden.

He never spoke on this floor, to me personally, nor has he ever written one word of the characteristic fan-shaped densities which extend from pleura to hilus, with the apex of the triangle towards the hilus.

Dr. Cole's reading of conglomerate tubercles is wrong and I am prepared to show that Delafield and Prudden's classification is wrong. Yet Dr. Cole can see no difference between his work and my own, and I am unable to help him. If you try to give a roentgen diagnosis of pulmonary tuberculosis by the two methods and then have your findings carefully watched by an able clinician or checked up by the post-mortem you will soon know the difference between them.

The eye cannot distinguish upon the plates the densities of individual tubercles any more than the eye can see individual tubercle bacilli. The tubercles are too small. The large caseous masses often described as tubercles are made up of many tubercles and much besides. But since many tubercles are early distributed along the course of the bronchi of an infected area and since at an early time they extend in this fan-shape or cone-shape manner to the pleura they greatly increase the density of the lung tissue and this shows upon our plates.

Thus the eye can detect them as it can see a growth of the tubercle bacilli upon media. Sometimes the normal linear markings are blotted out by a cloud effect, again they are obscured by mottling and studdings, at other times there is a heavy density over the entire area penetrated by the markings from several trunks. All this I have described many times. But it is found nowhere, so far as I know, in the writings of Dr. Cole.

The chief difficulty which I have had with able clinicians has been over râles and their significance. The clinician believes that wherever he hears râles there are tubercles. He will not say this if you pin him down, but that is likely to be his inmost thought.

So he claims the lesion to be as extensive as the râles and you as roentgenologists will

often find the lesion less extensive. His argument will be that the stethoscope shows a more extensive lesion than the ray and thus he can make an earlier diagnosis than the roentgenologist.

The answer to this is now simple. When the râles are more extensive than the plate changes you are either dealing with a bronchitis, which is not tuberculous, or an edema. Usually the latter, and a few weeks in bed will clear up edema.

The râles which are distinctive of tuberculosis are heard at end of inspiration after forcible (cough) expiration. This is well for the roentgenologist doing chest work to remember.

There is no doubt in my mind that stereoscopic chest plates well taken can show tuberculous pathology both before and after the clinician fails to secure signs.

But the tubercles do break into the bronchi early and thus the clinician can early hear the râles if he listens carefully. Nothing in all my pathological research has been more striking than early breaking of the tubercle into the bronchi. Nichols, who has done much work in this field, claims that the tubercles start within the bronchioli respiratoris. I am not ready to accept this but if they do not, they start just outside the bronchus and break into it at an earlier time than is usually appreciated.

Thus the bronchus is the drainage tube of many small cavities which are scattered along the finer bronchi and which give us our characteristic plate changes.

There is one clinical sign of malignancy which must be looked for—ordinary pleural effusion does not move, unless the lung suffers from emphysema or is invaded by a tumor. Thus movable dullness means either hydro-pneumothorax, emphysema with effusion or lung tumor and the roentgen ray can differentiate these.

Dr. A. B. MOORE (closing the discussion): With regard to Dr. Pfahler's remarks as to the infiltration appearance of carcinoma: While I have seen relatively few post-mortems in the cases coming to autopsy the gross appearance was as typical as the nodules shown in the roentgenograms and could easily be differentiated from an inflammatory condition. I have seen two cases of *primary pulmonary carcinomatosis* in which I made a diagnosis of pulmonary tuberculosis. At autopsy both of these showed extensive primary carcinoma of the lungs without involvement of other parts of the body. The roentgenograms of these two cases were typical of a diffuse tuberculous infiltration except that there was no cavitation. In the roentgenogram of one of these, not made stereoscopically, because of the distress of the patient, there was an appearance of cavitation at one point. At autopsy, however, it was found that this was due to a dilated air space. The object of my paper is to call attention to the value of the routine examination of the chest in cases of malignancy. While I cannot answer Dr. Boggs' question with accuracy, I think that the majority of these cases have been of the scirrhous type.

Dr. Hickey's observation is of great value. I have found that some of our patients showed pleuritic involvement but I do not think it is a common feature. We see, however, many cases of malignancy with pleuritic involvement, even with bloody fluid in which we cannot demonstrate metastases in the lungs. It may be an independent or coexisting condition. In my experience an interlobar pleuritis is usually found in cases of inflammatory nature, often existing in sero-fibrinous pleuritis or in patients showing tuberculous involvement of the lungs, either active or healed.

Dr. Dachtler's remark is valuable. I believe that a routine roentgen examination of the chest should be made before any treatment is instituted in cases of malignancy. Stereoscopic examinations are of tremendous value. Like Dr. Case, I have seen one case diagnosed as a metastasis on the basis of a clear shadow of the nipple. In another case a diagnosis of lung metastasis was based on a single plate. That patient had two nodules of recurrence in the skin.

ROENTGEN SYMPTOMATOLOGY OF PULMONARY TUBERCULOSIS

BY FRANK S. BISSELL, M.D., MINNEAPOLIS, MINN.

IN a communication presented to this society in 1914, an attempt was made to describe a new symptom-complex of pulmonary tuberculosis, somewhat different from the classical one. It is my purpose at this time to stimulate discussion along this line, to the end that we may perhaps evolve a logical roentgen sign complex of this disease. It is my further purpose to point out some of the difficulties which constantly present themselves when one attempts to place the interpretation of chest roentgenograms upon a scientific foundation.

A review of the extensive literature upon the subject and personal communication with many members of this society have convinced me that the roentgen diagnosis of early tuberculosis must still be considered an art rather than a science. Many writers have insisted that the presence of the discrete tubercle is the only evidence upon which that diagnosis can be based. These writers have failed, however, to define a discrete tubercle, roentgenologically speaking, in such a manner that it may be differentiated by others.

Kennon Dunham has described an interwoven appearance of pulmonary striæ which he regards a sign characteristic of tuberculous infection. This contention has much anatomical and clinical support, the merits of which will be discussed in this paper.

The present studies are still incomplete, so that this communication can be little more than a further preliminary report of our clinical observations and the statement of the hypothesis upon which we have been working in our effort to determine the pathognomonic roentgen signs of pulmonary tuberculosis. Unfortunately, it is impossible, at will, to reproduce this disease in animals. Injection into a bronchus results only in a localized broncho-pneumonic process, without the development of those lung changes which are noted upon the natural invasion of the lung in man. We are thus compelled to rely entirely upon the study of human tuberculosis in the hospital and dispensary patient or after autopsy.

The obstacles to careful post-mortem studies have been frequently recited and are only too evident. By frequent raying of lungs immediately after removal from the body, we may hope to gradually accumulate enough cases showing the early changes of tuberculous disease without inter-current pneumonia or pulmonary oedema, to finally substantiate or disprove our hypothesis relative to the causation of the early roentgen signs.

A study of clinical cases is somewhat inconclusive because the earliest tuberculous changes are entirely unproductive of symptoms or physical signs; because a positive tuberculin reaction is not generally accepted as conclusive evidence of active tuberculous infection and because many cases of tuberculous disease of the lungs proceed to complete recovery either with or without treatment. To those who believe that a positive reaction is of some significance, and among these I desire to identify myself, there is some satisfaction in our observation that this reaction and the presence of the phenomenon of peripheral interweaving seem to go hand in hand. Thus, in 63 consecutive cases in which a positive constitutional reaction was obtained, the characteristic interweaving was noted in every case. In 12 cases, which were negative to tuberculin, the net work was absent in 10, while in the other 2 it was atypical.

Objection is very properly made that many healthy individuals will show this interweaving in their stereoscopic plates. I contend, however, that this fact is not neces-

sarily opposed to the contention that this sign is evidence of recent tuberculous infection. It must be constantly borne in mind that the disease is one concerning the natural history of which little is known. We do know that it may be a disease of such slow progression, that an individual may be actively tuberculous throughout a long lifetime and finally die of some inter-current disease.

With this thought in mind, the problem resolves itself into one of determining the degree of progression, the immunizing power of the individual and the presence of mixed infections. In this determination, the roentgen rays must always occupy a most important field, but not alone by any method can this question be settled in a given case. One must in the last analysis, rely upon his diagnostic logic to determine the prognosis and the proper line of treatment. Since we are not considering this problem from a sociologic standpoint, we are concerned only with clinical cases manifesting symptoms of disease. In such cases it is the function of the physician, not only to recognize the existence of tuberculous infection, but also to eliminate as far as possible the presence of other symptom-producing lesions. When these two things have been done, it is perfectly logical to institute treatment of the tuberculous infection. If symptoms subside, and subsequent roentgenization shows no progression of the lesion, the patient may be safely discharged. A woman in the sixth month of pregnancy was recently examined and her case diagnosed incipient pulmonary tuberculosis upon *x*-ray evidence alone. The signs consisted of fine interweaving near the periphery a few groups of very soft "pinhead" shadows along the vertebral trunk and in the first interspace on the same side. Two weeks later, a second roentgenization of the chest showed extensive infiltration of one apex, slight infiltration of the other, while distinct physical signs were present. The existence of pleural or diaphragmatic adhesions, or of an area of thickened pleura covering some portion of the lung, is strong confirmatory evidence of the tuberculous nature of a pulmonary infection. A screen examination should always be made in doubtful cases, and a delayed or limited movement of one or both diaphragms should be considered some evidence of activity.

If this fine inter-weaving, the so-called Dunham net work, is of such significance as we now believe it to be, it is of the utmost importance that it be interpreted in the light of known pathology. It is Dunham's later contention, that it is due to a process of fibrosis.* This appears to me an illogical conclusion because fibrosis is a late change in the history of the tuberculous lesion. It occurs only in advanced or in exceedingly chronic lesions. We are now working on the hypothesis that these interwoven striæ are in fact a visible and early manifestation of the actual tubercle. When the bacillus tuberculosis lodges in the tissues, it always becomes surrounded by endothelial leucocytes or cells of a similar character, to form a tubercle. These cells continue to multiply until they have obliterated, by actual encroachment, the tiny bronchioles and arterioles in the immediate vicinity. With this alteration in structure may not these bronchioles and arterioles become less radiable and thus productive of a linear radiation about the tubercle itself?

Since the chief histological characteristic of the tubercle is its non-vascularity, central necrosis occurs very early in its development, and it may be that the tubercle itself becomes roentgenizable only when this necrosis has begun. It has been, and is, my contention that the true tubercle does, at least in certain stages of development, present distinct characteristics of size, grouping and density which render its differentiation from similar lung shadows possible to the experienced roentgenologist.

If both the primary infection of childhood and the secondary infection observed in adult life are air-borne infections, we have a purely mechanical explanation for the distribution of the early tuberculous lesion in

* "Stereoroentgenography in Pulmonary Tuberculosis."

the lung field. The infectious particles are caught in the finer terminal bronchioles near the periphery of the lung and at various points of bifurcation and angulation, the first tubercles developing at these points. Since the pleura receives some of its blood supply from the bronchial artery, the early pleuritis frequently observed is probably secondary to the development of these peripheral peribronchial tubercles. Roentgenized cases of tuberculous pleurisy will, at any rate, usually show peripheral interweaving and other evidences of pulmonary tuberculosis. I have not observed any characteristic differences between the early roentgen manifestations of tuberculosis in children and in adults, except a tendency toward complication by bronchopneumonia in children and by pleuritis in adults.

METHOD BY WHICH STATISTICS WERE COMPILED

1st. (A study of Aug., 1914, to Aug., 1915.) All cases rayed to determine presence or absence of a tuberculous infection of the lungs.

2nd. A survey of the clinical records to determine the percentage of confirmed diagnoses.

3rd. A re-examination of all the roentgenograms to eliminate those errors due to hasty conclusions not substantiated by more careful study of the plates. This re-survey was made without knowledge on the part of the examiner as to the clinical classification of the cases.

4th. A careful review of the histories of the non-confirmed cases to learn whether symptoms might confirm the roentgen diagnosis and whether other lesions had been found to explain them.

Total undiagnosed lung cases rayed	297
From out-patient department	186
" hospital	111

ANALYSIS OF 111 CASES

Roentgen diagnosis "pulmonary tuberculosis"	64
" " "negative" or "indeterminate"	23
" " "Hodgkins"	3
" " bronchiectasis	7
" " lung abscess	1
" " pneumonia	4
" " streptococcicosis	9

ANALYSIS OF 64 CASES

Sustained by final clinical diagnosis	38
Partially sustained by clinical diagnosis	8
By reaction to 10 mgr. bureau tuberculin	13
By animal inoculation	1
By autopsy	2
By baccili in sputum	5
By physical signs considered positive	17
By physical signs considered doubtful	8
Unsustained by final clinical diagnosis	18
With symptoms not explained by another diagnosis	13
Extensive fibrosis or other evidence of an inactive process	5
Total cases not diagnosed T. B. (*x*-ray)	47
Shown later to be tuberculous	1
Cases in which negative diagnosis was clinically sustained	46

CONCLUSION

1. The tuberculous lesion, very early in its development, presents certain distinctive characteristics recognizable in the roentgenogram.

2. The differentiation of symptom-producing from non-symptom-producing tuberculous lesions is a clinical as well as a roentgenological problem.

3. The roentgenogram frequently presents the only objective signs of the disease and a roentgen study of every case is of the utmost importance from the standpoint of diagnosis and of prognosis.

4. The coördination of positive roentgenographic data and the constitutional tuberculin reaction is significant.

820 *Donaldson Bldg.*

DIAPHRAGMING ROENTGEN RAYS

STUDIES AND EXPERIMENTS

BY HOLLIS E. POTTER, M.D., CHICAGO

X-RAYS which arise from points outside the anodal focus and gain passage to the plate are detrimental in roentgenography in that the main image is veiled or choked. Striking through the tissues at indifferent angles every one of these aberrant rays tends to neutralize the contrasts and detail being recorded by the focus rays in their truly radial path through the tissues. The source of these vagabond rays is two-fold, first, from points in and about the tube other than the anodal focus, and second, from points in or about the tissues, the so-called "object secondaries." Both groups contribute toward the diffuse effects seen on all our plates to a greater or less extent and especially when large sections of deep tissue are attempted. In fact these useless rays give us so much trouble, in spite of our present-day developments in apparatus and technic, that the problem of their suppression is one which demands our closest study.

Of the two groups the second is probably the more harmful because the rays strike the plate at higher angles. Upon this point we have two authoritative statements. Cooledge after successfully suppressing the aberrant rays from the tube reports only a minor improvement in the brilliancy of radiographic shadows; and Bucky after suppressing the second group or object secondaries shows a most marked improvement. The use of unidirectional currents, tubes which are valve-like in their action, hooded anodes, and all diaphragm apparatus limit the number of vagabonds from the tube. The special diaphragm grating devised by Bucky is aimed directly at the suppression of the object secondaries.

Roentgenologists have never considered Bucky's grating diaphragm a practical instrument to use because of the harsh gridiron shadows of the grating which detract so much from the anatomic shadows visible in the interspaces. And yet the Bucky principle is worthy of great commendation in that it gives a final diaphragming effect over a rather extensive field. With these facts in mind the author began some time ago a quest for a system of diaphragming external to the tube which would suppress either or both groups of aberrant rays without the drawbacks of either the simple tubular diaphragm or gratings of the Bucky type.

Now Bucky's grating would do the work if it could be made invisible. But in order to perform its function the material composing it must be of high atomic weight and must therefore cast a marked shadow if allowed to remain at rest. If the shadow of the grating is to be neutralized some type of motion is naturally suggested. Simple experiments showed that any regular or irregular motion served to detract from the intensity of the gridiron shadow by distribution in a more or less even manner over the surface of the plate, but it soon came to be realized that it was a much more difficult problem to entirely efface it. Some signs of the grating shadow could always be seen.

It seems axiomatic to state that if such a grating is to leave no marks on a plate its construction and motion must provide that each and every portion of the plate be covered and uncovered for equal spaces of time and the grating moved at a continuous and uniform speed. This appears to be the fundamental consideration in deciding on a plan for a multiple tubular grating diaphragm which is to be interposed between tube and plate to perform the function of a diaphragm and yet neutralize its own

shadow by motion. Before attempting such a construction it is also advisable to consider the following propositions which are capable of proof on paper or by experiment:

1.—A wire may be moved across a sensitive plate during a constant exposure to *x*-rays without producing a visible shadow provided it is moved at a uniform speed and the direction of its motion is at a considerable angle to its axis. During this motion the wire successively covers up each and every sensitive point for equal lengths of time leaving it also exposed for equal periods. The resultant effect on the plate due to the passage of the wire will be only that of slightly subtracting from the total exposure of each portion.

2.—Should a strip of lead be placed on edge and moved as the above wire with the added precaution that the strip be constantly tilted during its passage over the plate so

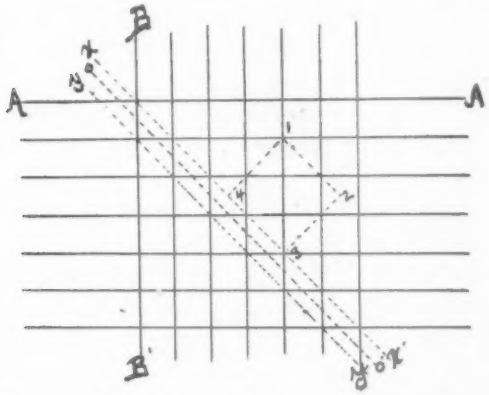

Fig. 1. A diagram of the top of a grating. The absorption of efficient rays along a line *xx*, one of the diagonals, is less than that at line *oo*, between the junctions of the squares. *1*, *2*, *3* and *4* are the corners of a square which may be the path of motion of the grating.

that the plane of its faces constantly cut the anodal focus the resultant effect on the plate would be similar to that of the wire. No shadow would be visible.

3.—Numerous strips on edge if placed equidistant and on parallel lines and all moved in the same direction will satisfy the requirements for invisibility if each strip is individually tilted, as in proposition two, so that its face is constantly in the plane of the rays and thus has the shadow-producing qualities of the wire.

4.—Add to these a second similar set of parallel strips placed at right angles to them, and if interwoven by slotting one has a rigid grating such as described by Bucky. According to the above propositions this complex could be moved along the diagonals of the squares so formed and if the rigidity of the construction did not prevent the con-

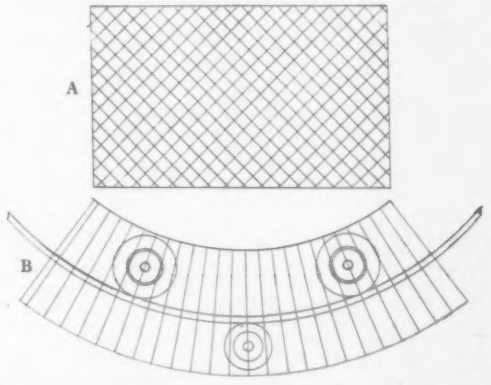

Fig. 2. A shows a plan of the top of tubular grating for use below the tube. B shows a plan of the same as seen from the side. The movement is along the curved track whose center of curvature is at the anode.

stant tilting of the strips the whole would be invisible. With a rigid construction, however, any considerable motion along the plate causes all the strips to present more or less of their faces to the efficient rays and a widening of their shadows results.

5.—When two sets of such parallel strips cross as above, another exception to their total invisibility arises when the material is of appreciable thickness. The motion being along their common 45 degree line there will be relatively less shadow cast at the point where the strips cross than at other points since here there is only one width of material presenting, whereas between junctions there are always two widths. A suitable compromise is to have the line of motion slightly off the diagonals. (See Fig. 1.)

While it may be possible that other constructions combined with other motions may be shown to satisfy the practical require-

ments for invisibility, the author's only successful experiments have been with multiple tubes of square or diamond shaped cross section and a motion along or nearly along the diagonals. All have been of rigid construction. The above propositions deal with conditions which are met with in moving flat gratings over a plane surface such as a plate and kept practically in contact with it. Were our plates portions of spherical shells instead of planes the problem would be quite simple as will be seen from the following.

A plan for constructing an invisible multiple diaphragm apparatus which may be mounted just below the tube and whose function is only that of suppressing the first or upper group of vagabond rays is theoretically quite simple. Fig. 2 shows diagrams of such a contrivance and Figs. 3 and 4 photographs. The distance below the anode is seven inches and both the upper and lower edges of the grating lie in the circumferences of spheres whose common center is the focal point. The planes of all strips of the grating pass through the focus. The spherical grating is made to move to and fro on ball bearings along a track so curved as to be always equidistant from the focus. At all positions of the grating on its track a fluoroscopic view shows that the efficient light passes freely down each individual tubule and that its only shadow at rest is that equal to a wire screen of the same mesh. In all practical tests, even when the to and fro motion is carried on by hand, the resulting roentgenograms show the diaphragming effect over a large field without evidence of grating shadows.

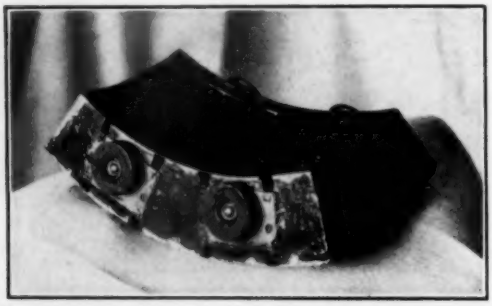

Fig. 3. Photograph of tubular diaphragm outlined in Fig. 2.

As to the efficiency of multiple tubular diaphragms an investigation shows that the practical diaphragming power of each individual tubule is less than that of a single similar tubule mounted in a plain disk diaphragm. Ordinarily the clean-up effect of a single tubular diaphragm is not only dependent upon its small cross section, the great length of the tube and the absorbing power of the material composing the interior walls, but is also assisted by the disk above to which it is fastened. In multiple diaphragms the factors for each tubule are the same except for the absence of that opaque disk adjacent to its upper end. Instead there is another similar tubule adjacent on either side. A study of the drawing in Fig. 5 shows the leakage of aberrant rays through adjacent tubules into the field on the plate which is being also screened by the absorption of the tubule faces. The inference is that to obtain complete absorption of aberrant groups right up to the focal point, the grating must be made of fine mesh and long tubules used. The author has found no practical difficulty in constructing gratings which completely obliterate the stem shadow from pin-point images made with the Coolidge tube. For gas tubes the clean-up is similar.

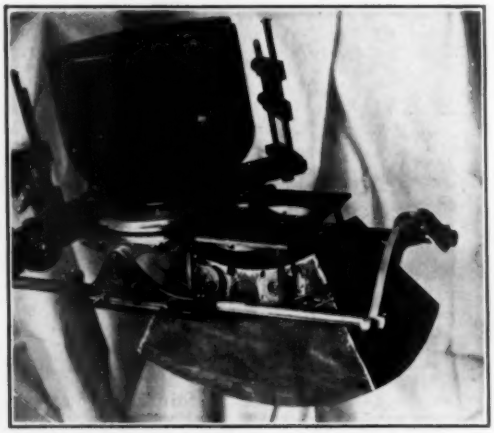

Fig. 4. Multiple diaphragm for experimental work being fitted into tube stand.

The absorption of the second group or object secondaries might be accomplished with a grating of the same type of construction and motion if the plate were spherical instead of flat. However, it is possible to compromise some of the theoretical requirements and produce a Bucky diaphragm effect with practical invisibility. Take a Bucky grating and move it but a short distance either way and the lack of perfect tilt of all the strips is inconsequential. A circular motion would be the easiest to produce, but this is very bad for invisibility. Any correct motion must be along or nearly along the line of the diagonals of the squares. Instead of a circular motion a movement along the lines of a square has been found most useful. (See Fig. 1.) A Bucky grating is mounted on a skeleton platform. Ball bearings and a track allow the grating to move in a linear direction along the platform. The platform itself is mounted so that it may move on another track at ninety degrees to the first. Thus the grating has universal motion and may be guided in the square direction above described by a mechanism at the side.

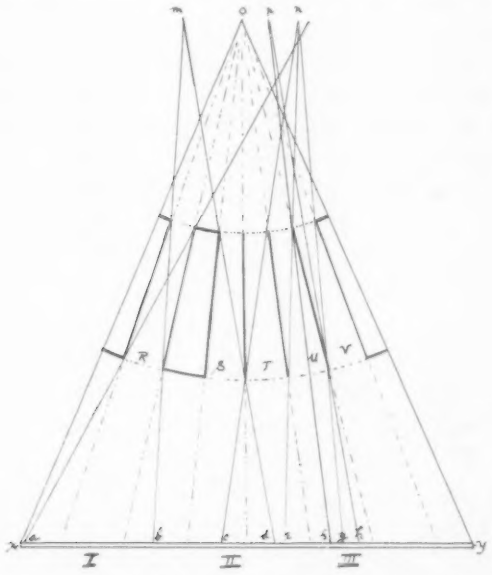

FIG. 5 shows three points about diaphragming.

I. *R* is a single or simple tubular diaphragm mounted in an opaque disk; *mb* is the ray most distant from the focus which can strike the plate *xy*.

II. *S* and *T* are adjacent tubules of a multiple diaphragm. It is seen by the construction that at the space *cd* on the plate a certain number of aberrant rays through one tubule are projected upon the normal field of its neighbor. The construction is that of a coarse diaphragm so as to exaggerate these points.

III. This shows the ray-absorbing action of the face of each tubule, such as *V*. The face between *U* and *V* absorbs all the aberrant rays at *n* and points more distant from the anode. *Eg* is the shadow of this face on the plate with reference to point *n*. With reference to point *p* nearer the anode *o*, the shadow of this face on the plate is narrower as seen at *fn*. The diaphragming action of multiple diaphragm is the action of each of the tubules minus the leakage from the tubules adjacent. The sketch also shows that this leakage effect is less marked when the plate and diagraphm are near together.

CONCLUSIONS

1.—The elimination of practically all of the rays not useful in practical roentgenography is made possible, even over large areas, by the use of composite tubular diaphragms so constructed and moved as to neutralize their own shadows.

2.—Diaphragms of this type are useful both when mounted below the tube and below the patient.

3.—Much needless time may be saved in experimenting on composite tubular diaphragming, if it is constantly remembered as fundamental that invisibility is only secured when each and every portion of the sensitive plate is successively covered and uncovered by the grating for equal periods of time.

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EDITORIALS

The abstract in a recent number of this Journal of an instrument for the measurement of *x*-rays by an ionization method raises a very important question. All of us realize the need of better means of measurement in roentgen therapy. Otherwise the experience gained by painstaking labor and careful observation is not rendered available for others.

Yet it must be admitted that the introduction of unusual methods, involving an experience very different from that possessed by the roentgenologist and where the conditions for *reliable* readings are hard to obtain is quite likely to do harm and even to discredit measurements in general.

The profession must not be misled by the use of scientific terms. Certainly ionization methods are invaluable in the research laboratory when they are used by those specially trained to recognize the conditions which must be obtained for reliable results. But it may well be doubted whether the introduction of even well-designed apparatus of this kind for routine work would be conducive to better results, as it would be very hard to obtain the conditions needed while actually treating the patient.

The ionization of a gas renders it able to conduct electricity when subjected to electric tension or voltage. Every atom of the gas is made up of minute negative particles (electrons) and a total positive charge equal in amount to the negative. Certain processes will disrupt the atoms so that electrons and + remainders will be separated. When such ionized gas is between two conductors and a considerable voltage is applied the electrons move toward the positively charged plate and the + remainders in the reverse direction. The latter are a few thousand times as heavy as the electrons and are slow moving. If left to itself an ionized gas rapidly regains its non-conducting state because of recombination of the + and − portions.

If one is to measure the activity of the ionizing agent by the current between the plates (current=electron charge multiplied by the number of electrons reaching the wall

of the chamber per sec.) we must remove the ions at high speed to prevent loss by recombination. To do this the voltage applied to the ionization chamber must transfer the maximum attainable or saturation current (i. e., get the ions out quickly).

Roentgen rays will ionize a gas and so long as the passing rays do not excite the peculiar secondary rays characteristic of that gas the amount of ionization is quite in proportion to the radiation *absorbed*. Roentgen rays striking the metal conductors will cause extra ionization in the chamber. This makes readings too large and by an amount difficult to estimate. Only in rare cases have all the rays been absorbed in the gas. The amount absorbed varies with the tube hardness and there is no simple way to correct for the rays not absorbed.

The conditions for reliable measurements may in part be stated as follows:

(1) Complete absorption of all roentgen radiation entering the chamber by the gas to be ionized. Or at least a constant fraction of the total.

(2) The characteristic secondary rays must not be excited to an extent interfering with the readings.

(3) The voltage applied to the ionization chamber must be large enough to secure saturation current.

(4) The electroscope, electrometer or galvanometer used and all connections must be well protected from radiation.

(5) The rays must not strike the walls of the chamber setting up corpuscular or secondary effects.

It may well be doubted whether any *simple* and *convenient* device meeting even most of these conditions can be devised, and apparatus to do this work well is too complicated to meet the needs of routine treatment. Such appliances in well-equipped research laboratories are invaluable and when the results are properly worked up and presented they will be of great help in therapeutic work. Done otherwise we will only cumber the pages of the literature with misleading results, and our offices with trinkets soon to be discarded at an expense we can ill afford.

That the writer is not alone in this contention is shown by a remark of Wertheim-Salmonson in the November, 1915, number of the *Physikalische Zeitschrift*. Where he says "it remains an open question concerning the reliability of the photographic method," personally I am inclined to highly regard the same and believe it to be the best of the methods known at present. The various ionization methods are so liable to various errors that they should be left in the hands of skilled and critical physicists.

J. S. S.

* * *

In a recent number of the *Scientific American* appears a very interesting account of the use of red light in the illumination of operating rooms where the surgeons are using the fluorescent screen for the location of foreign bodies. By securing a color in the overhead, light complementary to the actinic light of the screens, the surgeon is able to change from one illumination to the other with practically no delay. This seems a very important observation and will undoubtedly be of great service in the treatment of fractures. It is evident that the metal bone plate has outlived its usefulness, and that future advances in the treatment of fracture will be made with the use of the fluoroscope. We hope that period of the long, time-consuming attempts at reduction and the checking of failures with plates is passed and that the modern protected tube boxes will give great possibilities of manipulation under the fluoroscope.

Testimonial Dinner to Dr. Crane

One of the very pleasant features of the meeting of the roentgenologists, held in Detroit on Saturday, February 5th, at the Hotel Statler, was the testimonial dinner which was tendered to Dr. A. W. Crane,

our president, by his many friends who assembled at the meeting. Dr. Henry Hulst officiated as toastmaster, and the following is the list of toasts:

CRANE (The Man), Dr. Edward H. Skinner.
"An honest man, close buttoned to the chin,
Broadcloth without, and a warm heart within."

CRANE (The Physician), Dr. James T. Case.
"Every one is a physician, or a fool, at forty."
—Old Maxim.

CRANE (The Roentgenologist), Dr. Preston M. Hickey.
"Shine out, fair sun, till I have bought a glass,
That I may see my shadow as I pass."

The response by Dr. Crane was a very memorable one, which was thoroughly enjoyed by those present. His résumé of some of his earlier difficulties and his pleasing remarks concerning some of his early acquaintances were well received.

Society Proceedings

The meeting of the Roentgenologists, held in Detroit on Saturday, February 5th, was very well attended, and much that was new and interesting was presented.

The following program was presented:

"Diagnostic Errors in Diseases of the Ribs Revealed by Stereo-Roentgenograms"—Dr. Emil G. Beck (Chicago).

"Early Diagnosis of Pneumonia by Roentgen Examination before Physical Signs Obtained"—Dr. L. T. LeWald (New York).

"Demonstration of the Trachea"—Dr. Preston M. Hickey (Detroit).

"Progress and Prophecy"—Mr. H. Clyde Snook.

"The Preparation and Management of Barium Meal Cases"—Dr. L. L. Jones (Battle Creek).

"Roentgenographic Studies of Patients with Closure of the Pylorus"—Dr. L. T. LeWald (New York).

"The Roentgen Diagnosis of Intestinal Fistula with Reports of Cases"—Dr. James T. Case (Battle Creek).

"Segmentation as an Aid in Diagnosing Stomach Lesion"—Dr. Paul Eisen (Chicago).

"Osteopsathyrosis"—Dr. E. Blaine (Chicago).

"The Interpretation of Blood Changes in Malignancy"—Dr. J. Walter Vaughan (Detroit).

"A New Palpating Instrument for Duodenal Diagnosis"—Dr. Edward H. Skinner (Kansas City).

"A New Timing Device for Roentgen Therapeutics"—Dr. Rollin H. Stevens (Detroit).

Demonstration and Discussion of Miscellaneous Plates and Slides—Dr. Leonard Reu, Dr. A. W. Crane, Dr. E. H. Skinner, Dr. Wm. A. Evans, Dr. Henry M. Hulst, Dr. A. M. Cole, Geo. F. Thomas, Dr. M. J. Hubeny, Dr. H. E. Potter.

The lantern slide demonstration in the evening was varied and interesting. A fuller account of the meeting will appear in a later issue of the JOURNAL.

Announcement of Annual Meeting

The Seventeenth Annual Meeting of the American Roentgen Ray Society will be held in Chicago at the Congress Hotel, Michigan Avenue, September 27, 28, 29, 30, 1916.

This date has been selected after much deliberation in order not to interfere with meetings of state and other societies in which our members are interested.

The hotel is situated downtown, but is slightly removed from the bustle of the city. A meeting hall, room for plate and manufacturer's exhibits, and the entertainment of members and guests can be provided under one roof.

The Executive Committee has voted that at the next annual meeting a sufficient part of the front portion of the hall, to accommodate all members and invited guests, be roped off and reserved, and that badges be furnished to those entitled to these reservations.

ROLAND HAMMOND,
Chairman of Executive Committee.

CORRESPONDENCE

LETTER FROM DR. I. SETH HIRSCH

To the Editor:

Though fearfully averse to entering into what appears to have even the semblance of a controversy with one who has by his often brilliant and always dramatic demonstrations contributed so much to roentgenological diagnosis, there are, nevertheless, in the article in your issue of November, Roentgen Diagnosis of Indurated Ulcer, by L. G. Cole, so many points demanding comment, challenge, criticism and commendation that I cannot refrain from analyzing it. After viewing the beautiful illustrations of the article, my visual memory rushed me to two articles by Cole in the *New York Medical Journal*, both on the subject of the radiographic diagnosis of cancer, one of February 14, 1914, on the positive and negative diagnosis and the other of July 3, 1915, on the negative and positive diagnosis of cancer, and I found strikingly similar illustrations to Figures 4, 10, 11, and 13, given as examples of gastric ulcer, doing heroic service in other articles under the banner of duodenal ulcer and cancer.

The Figure 13 of Case 13 of the article, or figures almost exactly similar, have apparently been doing most magnificent service since February 14, 1914, when it first was published in the *New York Medical Journal* as Figure 17 *a* and *b* under the caption of a growth resembling a duodenal ulcer but of undetermined malignancy with the history that for *three years* the patient had experienced pain in the epigastrium two hours after eating. An astonishingly similar illustration was published a second time in the *Lancet* of May 2, 1914, in an article on duodenal ulcer under the caption "Profile of Ulcer;" a remarkably similar illustration was published the third time in the *Annals of Surgery*, January, 1915, under the caption "Ulcer of the Gastric Side of the Pyloric Sphincter with Encroachment of the Cap," the name "P. O'B.," the history being of *five years' duration* with the additional information of the presence of eructation of gas and sour fluid, black stools with pain two or three hours after eating, and a strikingly similar figure published for the fourth time in the article in your November issue, as an indurated ulcer with a bullet-hole crater, the name being given as "O'B.," the clinical history now being given as unknown.

I mention this not in any sense as a vindictive criticism but only to point out that when one of Cole's recognized ability and standing exhibits this uncertainty regarding the meaning of the morphological deviations by his own direct method, who will dare be dogmatic.

Now as to the plaint of a literature scanty on gastric ulcer, may I be permitted to point out the articles by Bardachzi, Eisler, Bela, Haenisch, Holitsch, Holland, Jordan, Knox, Levy-Dorn, Openchowski, Petren, Pfahler, Rieder, Schmieden, Schwarz, and Strauss, besides numerous articles by lesser lights, many of which have great value as accurate observations truthfully recorded, to say nothing of the numerous contributions to the subject by Haudek and Holzknecht. In these writings not only is the Haudek niche described but the so-called callous or indurated ulcer is defined, its pathogenesis detailed, its radiographic demonstration and differentiation dwelt upon at great length.

The contemptuous reference in the second part of the conclusion to the symptoms-complices which are also disdainfully referred to in the text of the article as almost unworthy of mention, shows a lamentable tendency to maintain a controversy for which Cole is considerably responsible between the so-called direct and indirect methods. Its paltriness makes it unworthy as a subject for differences of opinion

among men of mature understanding and does not advance the art of roentgenology one jot. The fanatical adherence to one particular method, to the exclusion of every other valuable contribution to a subject, is a mental attitude that is, to say the least, unscientific. No one who sees things broadly in roentgenology denies the value of the morphological study which has been dubbed erroneously the direct method, nor fails to acknowledge the great worth of the functional study.

For there is in vogue no direct method in the radiographic study of the gastro-intestinal tract. The only direct method would be the method of Hemmeter to fill, if possible, the ulcerating surface with bismuth, leaving the stomach empty so that the ulcer could be actually viewed in the sagittal and profile views as bones are or the method of Lenard, gas distension and stereoscopy. There is neither more nor less directness about the incisura opposite the point of ulceration or the deformity due to ulcer bearing area, than there is about an increase of peristalsis or a residue occupying a certain position in the stomach or the displacement of the pylorus to the left due to a retraction of the lesser curvature or to the evidence of hypersecretion. Cole studies the progress of the peristaltic wave. Is not this the indirect effect of the ulcer? After all there are only two methods of study of any organ, its anatomy and its physiology. And that part of the physiological function of the stomach with which we are concerned is in a general way its motility and secretion and just as there are physiological disturbances without anatomic deviations, so there are anatomic deviations without physiological changes.

The niche of Haudek differs in its morphological aspect depending upon the depth of the penetration of the ulcer and its site and how it differs will be referred to later. But the clean-cut niche with normal adjacent stomach wall indicates a non-malignant ulcer. A malignancy may be engrafted on this and extend up or down the lesser curvature showing as a greater or lesser encroachment upon the stomach shadow from which something is thereby subtracted out of the lesser curvature about the ulcer-bearing area. These cases may be differentiated from the apparently simple or penetrating or perforating ulcers. Generally speaking, it is acknowledged that three varieties of ulcerations may occur in the stomach: the superficial erosions, the penetrating ulcer and the perforating ulcer. And their relation to niche formation may in a general way be stated as follows:

1. The mucous erosions which are superficial and do not possess sufficient depth to hold a fragment of the contrast media.

2. The penetrating ulcers which extend from the mucosa and submucosa into the muscularis, which have a definite crater, frequently shallow but capable of maintaining in its depth a fragment of the contrast media only when the stomach is completely filled and sometimes only in horizontal or right lateral position.

3. The perforating ulcers which extend through the muscularis to the serous coat with peritonitis and the formation of an accessory cavity, which either in the vertical or horizontal position holds a fragment of bismuth in its depths in spite of pressure and manipulation but in the vertical position the fragment of contrast media is surmounted by an air bubble.

Now it is therefore obvious that the transition from the superficial erosion through penetrating to perforating ulcer and finally to malignant degeneration, is possible and Cole's contention that the penetrating or, as he called it, the indurated ulcer is found in an earlier stage than the perforating ulcer is not at all remarkable nor is his finding of malignancy in a certain number of cases which show also the Haudek niche, astonishing. What is astonishing is the statement that every case with a Haudek niche and hour-glass contraction means malignancy. True, the penetrating

ulcer can be detected at an earlier stage for it is the earlier stage, if the case is there for observation. The experience of some who have a material of poverty-stricken phlegmatics who come for examination late in the disease, might not coincide with his whose fortune it is to examine the hypersensitive and exquisitely tender organs of the rich who seek the roentgenologist when the trouble is in its early stages. There is some justice in the contention that the term indurated ulcer is a bad one, for while pathologically descriptive it has no place in roentgen nomenclature for surely the calloused edges cannot be determined, the information given being solely as to its contour, not its consistency, and the above classification of flat erosion, penetrating and perforating ulcer has some meaning roentgenologically. The method of studying the Haudek niche, the shallow one of the penetrating ulcer and the deep one of the perforating ulcer is by fluoroscopic palpation with the "sediment mixture" in the vertical posture in every oblique position first, and then in the horizontal. When this

FIG. 1 (Case 1). Niche of perforating gastric ulcer showing a slit in the horizontal posture. Plate made somewhat later than Figs. 2 and 3.

FIG. 2 (Case 1). Niche of perforating ulcer, above level of contrast mixture. Posture vertical.

is done such a perforating ulcer as in Cole's Case 4 which the report of the surgeon gives as going through to the peritoneum, will not appear as a slit but will look like a niche with an air bubble. My illustration is (fig. 1) as like the illustration of Cole's (Case 4) as two plates can be. They are both filled stomachs (morphology plates) in the horizontal position, but note, in Figure 2 of my case when the stomach was half filled in the vertical position and Figure 3 when only the "sedimentation mixture" was administered, that the ulcer is the typical Haudek niche of a perforating ulcer which was found at operation. Does this perhaps account for the tragic failure of Cole in one thousand cases to observe a single case with such a niche in the pure perforating ulcer? Perhaps it is method, technique—who knows?

And since this is the case under discussion, may one ask why is another plate of apparently the same case published in the *New York Medical Journal* of July 3, 1915, under the caption "precarcinomatous area on the lesser curvature" and

FIG. 3 (Case 1). Niche of perforating gastric ulcer. Bismuth water ("sediment") mixture. Posture vertical.

in the text spoken of as a constant induration while in the article I am discussing in your JOURNAL he graciously awards himself the laurel wreath for having affirmed the non-malignant nature of the process. Since it could not be felt through the walls of the stomach by the surgeon, it was therefore not indurated, for on page 797 Cole defines the term "indurated ulcer" as "an ulcer which is surrounded by an amount of exudate into the submucosal and muscular coats, sufficient to make the induration detectable at direct palpation of the wall of the stomach during surgical procedure or necropsy. That is, any ulcer that can be seen or felt during a surgical procedure or autopsy without opening the stomach and examining its inner surface." Therefore, the illustration has no place in this article for that relates to indurated ulcers and since it was proven at operation to be non-malignant, then it really cannot be precancerous unless every ulcer is precancerous and this has not been proven any more than every colonic ulceration is a precancerous disease. It has, therefore, no place in the article in the *New York Medical Journal* under the types of gastric cancer. Where then has this orphan ulcer with its niche a proper resting place? May I suggest it? Non-malignant perforating ulcer of the stomach with Haudek's niche. So that Cole has one thousand cases with one non-malignant gastric ulcer "with niche such as Haudek described and Carman so graphically illustrated" but made in the horizontal position. He may now return to Holding the fine illustrations he borrowed. This is also made in the horizontal position and shows the niche clearly because the ulcer has more perigastritis, a longer isthmus and is probably more anteriorly in the lesser curvature than Cole's case.

Cole desires to prove by his cases that the "niche as Haudek describes and Carman so graphically illustrates" has no value in diagnosis of non-malignant ulcerations, but his own cases prove just the contrary. May I analyze:

FIG. 4 (Case 2). Showing niche after administration of bismuth water mixture. Posture vertical.

Case 4 shows a niche.
Case 5 " " "
Case 6 " " "
Case 7 " " "

Case 8 does not show a niche.
Case 9 shows a niche.

Case 10 does not show a niche.
Case 11 shows a niche.
Case 12 " " "
Case 13 " " " but shows it better in the *New York Medical Journal* article of February 14, 1914, as Figure 17b. The Cases 8 and 10 without niche show defects in the outline of the lesser curvature. In Case 8 a diagnosis of probable malignancy is made and justly so, while in Case 10, also previously published in the cancer article of February 4, 1914, the surgeon's findings and the subsequent history point it to be one of malignancy. The other eight cases show the more or less typical niche. For it is not necessary that the penetrating ulcer show a bud with air bubble while even the perforating ulcer which shows the bubble will not show the horizontal position.

FIG. 5 (Case 2). Niche not visible. Bismuth suspension mixture. Posture vertical.

FIG. 6 (Case 2). Niche not visible. Bismuth suspension mixture. Posture horizontal.

Carman graphically illustrates in his article in the AMERICAN JOURNAL OF ROENTGENOLOGY, April 14, 1914, in Figures 2x, 2y and 2z, how by a variation in the position in which the examination is made, the niche and the incisure may be brought out when in the sagittal view these will not be visible.

For many weeks I stood in that small, low-ceilinged room with its white-washed walls, with its dingy curtains and its musty smell, at Haudek's elbow, while he fluoroscoped and I still seem to hear his quizzical voice pointing out the niche of the penetrating ulcer, demonstrating its shallowness and the difficulty of making it fill and stay filled by a fragment of contrast mixture in the vertical position but showing it clearly in the horizontal and right lateral position, when the stomach was filled, in contrast to the perforating ulcer which even with the

sediment mixture may be demonstrated with its air bubble, its isthmus, its contracture; I seem still to hear his insistence on the maximum mobility between tube, patient and screen and on the examination in every direction, and I seem to hear him repeating almost verbatim the conclusion to which Carman and Miller (*Arch. Int. Med.*, Sept. 15, 1915) have also arrived, that a distinct residue six hours after the contrast carbohydrate meal almost invariably (90.4 per cent. in Carman's cases) indicates a pathological alteration of the mucous membrane of the stomach in the proximity of the pylorus—ulcer, gastric, duodenal or cancer. So much for the value of the motility test which Cole abhors.

May I recite a story in conclusion? Perhaps I have read it somewhere and perhaps invented it: A very wise man lived near a pond wherein were many fine fish. He noted how his neighbors sat patiently day after day and fished, sometimes catching nothing, sometimes one, or, when luck was better, a few. This seemed foolish to the very wise man, who would laugh in derision at the antics of the fishermen as they struggled with their lines. He was an impatient, restless soul. He chafed at the slowness by which the fish were caught by the usual method. He conceived there was a better, easier way of catching fish. So he betook himself to the apothecary and bought some poison which he poured into the pond. The next day the shores of the pond were covered with fish . . . and no one ever came to fish in that pond again.

Moral: There are better ways of catching fish than by poisoning the pond.

January 1, 1916.

I. Seth Hirsch, M.D.,
New York City.

LETTER FROM DR. LEWIS GREGORY COLE

To the Editor:

It is a great satisfaction to know that at least one subscriber to your journal has looked through the illustrations of Roentgen Diagnosis of Gastric Ulcer, and I greatly appreciate his kind remarks regarding their beauty. But I fear he has contracted the bad habit many of us have—that of reading the title of an article, looking at the illustrations, and reading the conclusions, or perhaps drawing our own conclusions. In proof of this it will be noted that a considerable portion of his criticism refers to illustrations rather than to the text of the article.

He observes that Figs. 4, 10, 11, and 13 have done heroic service in previous articles and therefore feels compelled to come to their rescue. But if he had realized that these figures were inserted to illustrate certain facts described in the text, and had carefully read that text instead of assuming that I had stated these cases to be cancer in one article and ulcer in another, he would have perceived they were not in need of a defense.

In bringing this subject to the attention of your readers, in such a masterly manner, my critic has done more to drive home the importance of the close relationship between indurated gastric ulcers and early gastric carcinoma than I had accomplished in two more or less extensive communications on the subject. Therefore, all who are interested in the early diagnosis and cure of gastric cancer should be exceedingly grateful to him for this service.

One who had read Dr. Hirsch's letter before I saw it said that he was blessed with the gift of . . . . literary genius with which it would be hard for me to cope and after reading it myself I realize the fact. Therefore, without any attempt at literary inspiration, we will consider the comment, charges, criticism, and commendation in the order in which they are presented in Dr.

Hirsch's letter so that the reader may have the least possible difficulty in following.

Figs. 4, 10, and 11 had been used in previous articles on gastric cancer to illustrate the text where I tried to emphasize the fact that an indurated ulcer or indurated area might be malignant or might become malignant. For the convenience of Dr. Hirsch and others who may have contracted the bad habit to which reference has been made, I will quote from these various articles that portion of the text which refers to these figures. It will then be obvious even to the casual observer that they illustrated the same fact regardless of the titles of the articles in which they appeared.

Fig. 4 in Roentgen Diagnosis of Indurated Gastric Ulcer is used as Fig. 7 in Negative and Positive Diagnosis of Cancer, and the text reads, "The second group of the operable cases illustrated in Fig. 7 are the indurated gastric ulcers which may or may not be malignant. Up to the present time it has seemed wise to follow the trend of general teaching, to consider that all indurated gastric ulcers are malignant or may become so at any moment, and to advise surgical procedure for the removal of the induration and the 'cancer bearing' area."

Fig. 10 in Roentgen Diagnosis of Indurated Gastric Ulcer is used as Fig. 16 in the cancer article of Feb. 14, 1914, in the *New York Medical Journal.* If ever a case could do service under two standards it was this one, as one of the two surgeons present at the operation considered it malignant, while the other thought it to be non-malignant. As Fig. 10 in the ulcer article it is entitled, "Indurated area without crater." As Fig. 16 in the cancer article it is shown as "Indurated ulcer, probably malignant," and the text of the article reads: "The deep constant sulcus on the lesser curvature was diagnosed as an area of induration, requiring immediate surgical procedure."

Fig. 11 in the Ulcer article labeled "Indurated area with depressed crater," appeared in the cancer article as No. 15, and was distinctly marked, "Indurated gastric ulcer, no signs of malignancy" with the text as follows: "The roentgenograms revealed an area of infiltration for about two inches along the lesser curvature. Its depressed center corresponded to descriptions of the 'saddle' ulcer. Immediate surgical procedure was advised. Surgical findings: Operation revealed an indurated gastric ulcer, but even at the operation it was impossible to determine whether the lesion was a simple ulcer with indurated edges or an ulcer with carcinomatous degeneration at the base. A microscopical examination of the specimen showed no evidence of malignancy."

The heroic Patrick O'Brien—by strange chance, No. 13—volunteered for duty first in the transactions of the International Congress of Medicine, in London, 1913. Although, unfortunately, he does not receive in Dr. Hirsch's letter, honorable mention for that engagement, reference is made to his later appearance in the *Lancet,* May 2, 1914, under the appellation, "Profile of Ulcer." In this capacity he illustrated that portion of the text which stated that in some instances the ulcer is viewed in profile so that one observes its indurated edges projecting into the intestinal lumen,* and its crater filled with bismuth. Limitation of space in that publication prevented a full description of the exact relation of the crater to the pyloric sphincter, but in all further consideration of P. O'B. this factor was fully discussed. In fact, in the *New York Medical Journal* article of Feb. 14, 1914, and in the *Annals of Surgery* article for Jan., 1915, he was specifically used to illustrate the borderline cases of ulcer that involve both the gastric and cap surfaces of the sphincter and great care was taken in the text to emphasize this point, an effort evidently only partially successful. The *N. Y. Med. Journal* article on cancer states: "The cap, although somewhat irregular, was less involved than the stom-

* The original manuscript read "lumen of the gut." This was altered by the editor to read "intestinal lumen."

ach. The findings corresponded with Moynihan's and Codman's descriptions of postpyloric (duodenal) ulcer, and yet the ulcer lay nearer the gastric than the duodenal surface of the sphincter, so it might be classed as either postpyloric or prepyloric." The *Annals of Surgery* article reads: "This corresponds with an ulcer of the cap, but roentgenographic findings indicate that most of the induration involves the stomach, rather than the cap, although the lesion may have started in the postpyloric surface of the sphincter."

The reference to discrepancies in the clinical history of P. O'B. is most interesting, and illustrates another important fact I have frequently stated—that I know nothing of the clinical history of the cases. One of my assistants took the clinical history used in the *New York Medical Journal* article and only a résumé was inserted. The clinical history referred to as given in the *Annals of Surgery* was written by Dr. Brewer with whom I published the article. The first records the additional information of the presence of eructation of gas and "bitter" fluid instead of "sour" as quoted by Dr. Brewer. As regards the omission of clinical history in the article to which Dr. Hirsch refers, my assistant was to supply extracts from the clinical history of cases, and she assumes full responsibility for this surpassing error.

I made no plaint as to the quantity of literature on gastric ulcer, or even as to the number of subscribers to articles on this subject. The list of authors to which Dr. Hirsch referred is strikingly similar to a list from the Index Medicus even in their arrangement and in omitting some of the lesser lights he may be exposing himself to the same criticism which he makes.

In regard to "contemptuous reference to symptoms complices" I would only say I am glad that my attitude is fully understood. I am not certain who dubbed the morphological study of the stomach the "direct method" in contradistinction to the symptoms-complices or the indirect method, but I think it was George. The name fits so well that it will persist as apt nicknames do, and if one fails to detect direct evidence of the indurated areas in any of the cases shown in the article under discussion it is the fault of my presentation rather than of the method of examination.

I certainly approve most heartily of the classification of gastric ulcer into the three groups described by Dr. Hirsch—a classification which would have shown greater originality if published prior to rather than after the appearance of the article criticized. Group 3 is the type of ulcer of which roentgen literature is full and Haudek's niche—the name applied to the deformity which he so graphically described—will make Haudek famous through ages to come. This is the group referred to in the second paragraph of my article (page 793) but not considered in the article. Group 1, mucosal erosions, was definitely referred to on page 797 in almost the same words that Dr. Hirsch uses later. This type of ulcer was not described in that article. Group 2 corresponds approximately with those which form the basis of my article except that in my work the diagnosis is based on the detection of the indurated area or the appearance of the calloused edge when the crater is present, rather than on the crater itself, the presence or absence of the crater being of secondary importance. Holzknecht and Haudek themselves in discussing this type of ulcer were good enough to refer to the roentgen findings as the "Cole and George defect." *

It might modulate Dr. Hirsch's reference to the "hypersensitive and exquisitely tender organs of the rich" if he knew that one-half of the cases described in that article did not pay one cent for the roentgen examination.

With amazement I read in Dr. Hirsch's letter, "The term indurated ulcer is a bad one for while pathologically descriptive it has no place in roentgen nomenclature for

* Ueber das Verhalten der Magenmotilitaet beim Ulcus Ventriculi und Duodeni. Holzknecht and Haudek. Fort. a. d. Geb. d. Roent. B. xxi. H. 6. s. 633.

surely the calloused edges cannot be determined, the information given being solely as to its contour not its consistency." . . . This is truly pathetic, since my whole paper hinges on the roentgen appearance of the calloused edge of the ulcer but if so keen a critic failed to perceive the all-important point I am indeed glad of an opportunity to reiterate it.

Case 4 was examined in the prone, erect, and oblique directions and the crater always appeared as the slit. In the postero-anterior position it appeared as a slit both in the erect and prone postures. In the oblique direction the surface of the slit comes into view. Hirsch doubts the possibility of a slit-like crater, but Carman, in describing the crater of ulcers, divides them into four groups and says of the first group: "They are either superficial denudations or *mere slits* in the mucosa incapable of holding enough bismuth to make a visible niche (fluoroscopically). Unless accompanied by an incisura or a six hour residue their presence will hardly be even suspected, much less positively determined." Only the art of a magician could have converted the slit-like crater shown in Fig. 4 into a typical Haudek's niche. I am far from saying that Haudek's niche or any crater of lesser degree than that described by Haudek is of no value, but I do say and still emphasize the statement that the induration accompanying these ulcers can be detected roentgenographically whether the crater is present or not.

The eloquent description of the low-ceilinged room with its white-washed walls, dingy curtain and musty smell accurately corresponds with my own recollection of this place but hardly seems relevant to the question at issue.

In the beginning of his epistle to the Editor Dr. Hirsch says there are many points demanding comment, challenge, criticism, and commendation. I look in vain for any real commendation until I come to the fish story, and the commendation of that so far exceeds the criticism of the previous portion that I am embarrassed by the tribute.

It seems to me, however, that in likening the malignant or non-malignant ulcers to innocent fish the comparison is not so apt as it would have been if he had referred to them as snakes, water moccasins, for instance, which had killed many of his neighbors. Then we may think of the very wise man who lived on the bank of this infested pond and who had noted how unsuccessful his neighbors were as day after day they sought by indirect methods to exterminate the snakes. This seemed foolish to the *very wise* man who laughed in derision at the antics of the fishermen as they struggled with their symptoms complices. He was an impatient restless soul. He chafed at the slowness with which the snakes were caught by the usual methods. He conceived that there was a *better*—not easier—method of exterminating these snakes. . . .

If this story were repeated sufficiently often, this man of resource might become as renowned as the Pied Piper of Hamelin—his only regret being that the deadly accuracy of serial roentgenology has spoiled the sport of his more patient and less restless neighbors.

Lewis Gregory Cole, M.D.
New York City.

DEPARTMENT OF DENTAL ROENTGENOLOGY

EDITORS

GEORGE M. MACKEE, M.D., AND JOHN REMER, A.M., M.D, NEW YORK

ORAL SEPSIS AS A FOCUS OF INFECTION*

ITS BACTERIOLOGICAL, DENTAL AND ROENTGENOLOGICAL ASPECTS

BY BYRON C. DARLING, A.B., M.D., NEW YORK

INSTRUCTOR IN ORTHOPEDICS, COLLEGE OF PHYSICIANS AND SURGEONS, NEW YORK; ROENTGENOLOGIST, ST. VINCENT'S, AND RUPTURED AND CRIPPLED HOSPITALS

THE roentgenologist occupies an unique position between the physician and the dentist in his obligation to their patients. In cases of gastro-intestinal lesions, urinary calculi, and fractures, the physician or surgeon may be expected to know more of the condition than does the roentgenologist, and it remains only for the roentgenologist to interpret his findings to them. In the field of oral surgery, however, both physician and dentist may learn of the roentgenologist.

The radiograph, properly interpreted, is practically infallible in oral conditions. To no branch of the medical profession is the need of oral prophylaxis more evident than it is to the roentgenologist; I believe it, therefore, to be his duty and well within his professional province to teach and demonstrate to the medical and dental professions, and through them to the public, that oral sepsis is a focus of infection and a menace to the community.

Medical literature, along this line since 1911, is most interesting, and has been increasingly so since 1913. It remained largely for Rosenow to connect the focus with the systemic condition and to identify the bacteria present. This he has done until he is able to claim that the following list of diseases could originate in oral sepsis: arthritis,[12, 13, 14] myositis, neuritis, neuralgia, and migraine; myocarditis,[19] endocarditis,[14, 15, 16] nephritis, and thyroiditis; gastric and duodenal ulcers,[17] cholecystitis, appendicitis, and such obscure diseases as Hodgkin's disease, the leukæmias, and pernicious anæmia.[11] Over twelve years ago Rosenow, with the coöperation of Billings, began experiments on animals to prove this connection between the focus and the infection. His writings are so fascinating that the originals should be read.

In 1914, Dr. Thomas B. Hartzell[3] confirmed Rosenow's experiments. He sums up the work of Rosenow in these words:

"During a series of studies lasting over eleven years, Rosenow has shown that streptococci found in the mouth or tonsils can be made, under suitable conditions,[18] to change into typical and encapsulated lanceolate pneumococci, capable of causing rapid and virulent pneumococcemia; or under other cultural conditions to produce organisms which determine in the joints, causing arthritis deformans; and under still different cultural conditions to produce streptococcus viridans, which is the characteristic organism in heart valve lesions; and under still other cultural conditions to become capable of causing ulcers of the stomach and bowels. In animals, Dr. Rosenow has experimentally brought about heart lesions. Recovering his organism from the heart lesions and comparing it with the injected strain, he has in turn caused ulcer of the

* Read before the American Roentgen Ray Association, at Atlantic City, September 23, 1915.

stomach. Recovering his organism from the ulcer of the stomach and comparing it with the original strain, he has caused joint infections. Again he recovered his organism from the joint, and has been able to produce typical pneumonia with an organism which originally was a harmless inhabitant of the mouth, and subsequently to recover from the diseased lung the original strain."

Referring to the alveolar abscess (Figs. 1-6), Dr. Hartzell says:

"In addition to osmosis occurring from the pockets and abscesses, we have the enormous force of occlusion to hasten the exchange of fluids between the lesion and the circulation. The pressure of occlusion acts as a piston pump against the peri-apical abscess and the lesion around the root (Fig. 6), applying by a pumplike action thousands of pounds in the course of twenty-four hours, thus hastening ordinary absorption."

Such investigations as these enabled Dr. Charles H. Mayo to say that "the next great step in preventive medicine must be made by the dentists" [6]; and he adds, "Will the dentists make that step?"

The earliest writings I have found are those of Dr. Benjamin Rush of Philadelphia, who said in his book, Volume 1 of "Medical Inquiries and Observations," as follows:

"Some time in the month of October, 1801, I attended Miss A. C. with a rheumatism in her hip joint, which yielded, for a while, to the several remedies for that disease. In the month of November it returned with

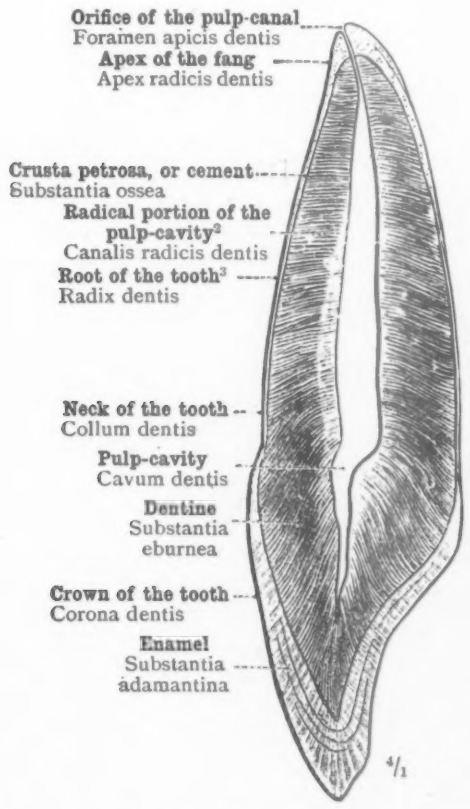

FIG. 1. Anatomy of the normal upper central or mesial incisor tooth in the sagittal section, the dentine, the enamel, the cement. (From Toldt's "Anatomy.")

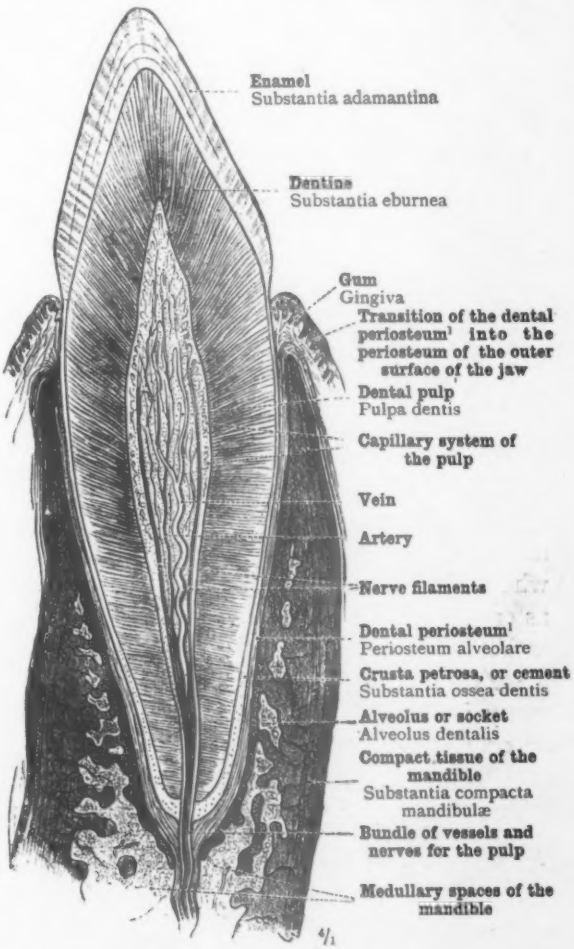

FIG. 2. Anatomy of the lower canine tooth with its pulp chamber, blood and nerve supply, alveolar process, periostum (pericementum) and gum margin. (From Toldt's "Anatomy.")

great violence, accompanied with a severe toothache. Suspecting the rheumatic affection was excited by the pain in her tooth, which was decayed, I directed it to be extracted. The rheumatism immediately left her hip and she recovered in a few days. She has continued ever since to be free from it.

"When we consider how often the teeth, when decayed, are exposed to irritation from hot and cold drinks and aliments, from pressure by mastication, and from the cold air, and how intimate the connection of the mouth is with the whole system, I am disposed to believe that they are often the unsuspected causes of general, and particularly of nervous, diseases. When we add to the list of those diseases the morbid effects of the acrid and putrid matters which are sometimes discharged from carious teeth, or from ulcers in the gums created by them, also the influence which both have in preventing perfect mastication, and the connection of that animal function with good health, I can not help thinking that our success in the treatment of all chronic diseases would be very much promoted, by directing our inquiries into the state of the teeth in sick people, and by advising their extraction in every case in which they are decayed. It is not necessary that they should be attended with pain, in order to produce diseases, for splinters, tumors and other irritants before mentioned often bring on disease and death, when they give no pain, and are unsuspected as causes of them. This translation of sensation and motion to parts remote from the place where impressions are made appears in many instances and seems to depend upon an original law of the animal economy."

Although, as early as 1887, Alfred Mentel, of England, had pointed out the relationship between the tonsils and rheumatic fever, and had proven that the tonsil is a path of entrance of the streptococcus to the blood stream, and although, over forty-three years ago, Pasteur established infectious bacteria as the specific source of disease, our contemporary literature on oral sepsis as a focus of infection dates back only fifteen years. When, in 1910, William Hunter,[4] of London, definitely pointed out septic dentistry as a possible source of disease, the medical profession paid little attention to it. More emphatically again in *The London Lancet* of January, 1911,[4] Hunter came out with his expression "American Dentistry." (Figs. 6, 10, 11, 12, 13 and 14.) This article, badly abstracted in *Current Literature,* aroused and stimulated American dentists, and marked the date of the beginning of their serious and keen work of investigation and experimentation.

The writings of roentgenologists on the subject are few, but emphasize the diagnostic value of radiography to the dental profession; as, for example, Pfahler, in *Roentgen Rays in Dentistry,* 1909[8]; Lange, in an article just previous to it; and MacKee, in *The X-ray in General Dentistry,* 1913.[6]

The medical profession was not then alive to tonsils or teeth as foci of infection. Let it be carefully noted that the dental profession was not false to the trust that was, from its very nature, theirs to warn the medical profession. As early as 1881 we find dentists writing on the subject; namely, L. C. Ingersoll, 1881[5]; A. Witzel, 1882[23]; W. J. Reese, 1886[11]; Louis Jack and C. N. Pierce, 1892-1895[9]; and others between 1880 and 1900. In 1901, Weston A. Price, Doctor of Dental Surgery, of Cleveland, said[10]:

"We will now turn our attention to the dentists' graveyard, root canal fillings (Figs. 4, 5, 6, 10, 11, 14), where so many cover up defective, careless work, trusting it will never come to light, and often reminding the patient that when this tooth gives trouble again it will have to be extracted. Humanity should thank God for a new light that will go into these dark places and show up what is often criminally careless or wilfully bad work in filling roots. True, it is often impossible to properly fill roots, but if all were as well filled as possible, those imperfectly filled would be only those with so small a canal or so little of it unfilled

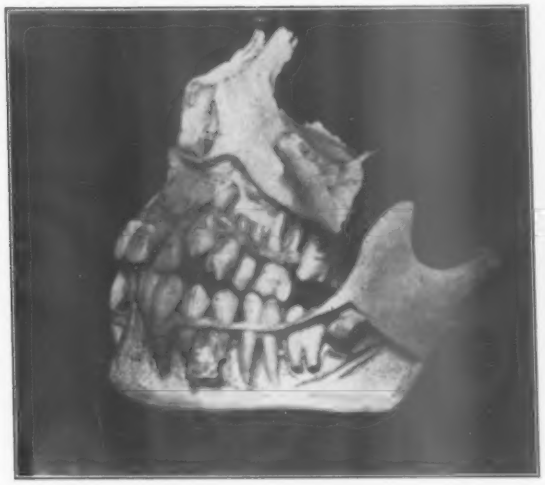

FIG. 3. Dry specimen (child): The normal alveolar process closely surrounds necks of teeth, roots, and apices. Here several teeth have as yet blunt, unformed apices.

FIG. 5. Dry specimen: 1 and 1*a*. Decay of canine. Infection extending to the apex produced large area of necrosis anterior to the antrum. 2. Alveolar absorption from pyorrhea. Other teeth likewise. Compare with Fig. 6.

FIG. 6. *X*-ray in the living: 1. Normal side showing cancellated bone detail. 1*a*. Large apical abscess (osteitis) following porcelain crown and pivot; infection caused by failure to empty and fill the canal. Such "whited sepulchres" must become diseased. Compare with Figs. 1, 2, 3, 4 and 5.

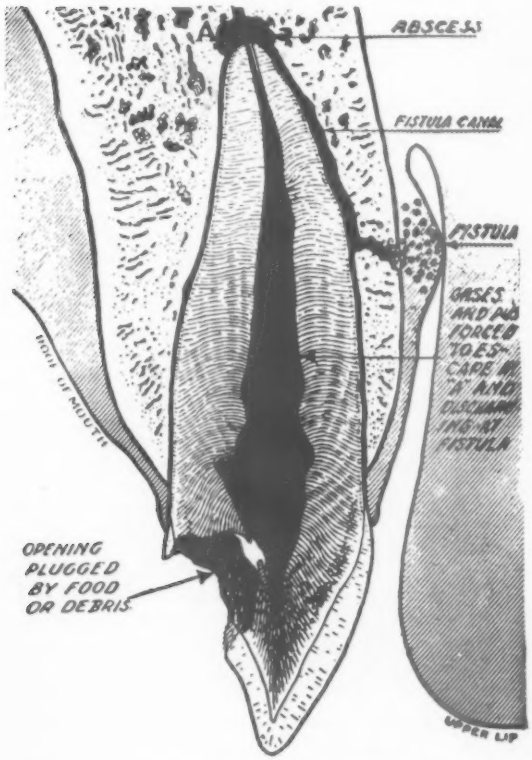
ABSCESS
FISTULA CANAL
FISTULA
GASES AND NO FORCED TO ESCAPE AT "A" AND DISCHARGING AT FISTULA
OPENING PLUGGED BY FOOD OR DEBRIS
UPPER LIP

FIG. 4. Diagram: The usual blind abscess (apical osteitis) has developed the less common fistula and gumboil. Compare with Figs. 1, 2, 3, and 5. (Diagram by courtesy of the Ransom & Randolph Co.)

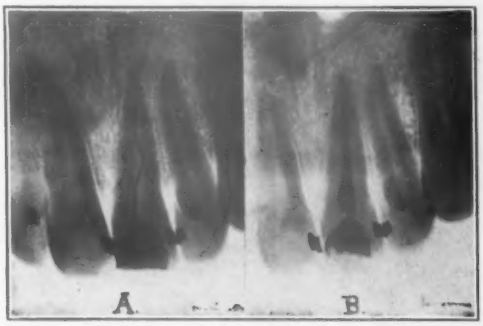

FIG. 7. *A*. Tooth with wire in root, showing that the canal has been emptied (aseptically) to the end. *B*. Same tooth, showing root canal filled to the end. (Dr. R. Ottolengui.) Compare with Figs. 4, 5, 6 and 14.

FIG. 8. Wet specimen: 1. Lower jaw. Snags or roots, a frequent source of apical osteitis. 2. Upper jaw. Extensive pyorrhea (Riggs' disease). Note the receded ulcerated gum, due to disease and absorption of the alveolar process beneath. Compare with Figs. 2, 3, 9, 10, 11 and 12 (1 and 4).

FIG. 9. Dry specimen: Stripping of all the teeth from alveolar absorption, especially the molars, which have become loose foreign bodies. Compare with Figs. 2, 3, 8, 10, 11, and 12.

FIG. 10. *X*-ray in the living: Extreme stripping from pyorrhea (Riggs' disease). Even the ends of the roots, as well as the entire alveolar processes, are absorbed. Note the uncleanly bridge on the lower front incisors. Compare with Figs. 2, 3, 5, 8 and 9.

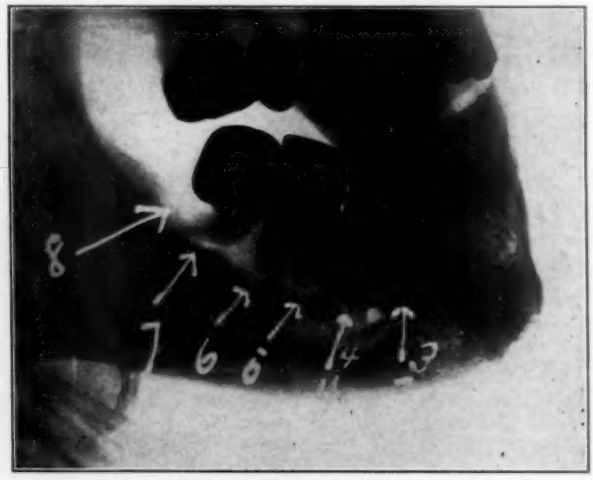

FIG. 11. *X*-ray in the living: Long history of arthritis. 3 and 4. Crowned teeth with root canals not filled, showing slight apical osteitis. 5, 6, and 7. Crowned fifteen years; roots completely stripped from alveolar absorption (pyorrhea) or from extension of apical osteitis; canals never emptied or filled. 8. Root lost through disease. Compare with Figs. 2, 3, 5, 9 and 13 (1, 3 and 4).*

that the woes of humanity from this source would be infinitely less than they are."

In 1906 there followed an article by M. J. Schamberg,[22] then of Philadelphia. In 1908 *Items of Interest* published a paper by M. L. Rhein,[12] of New York, and made the following editorial comment on it:

"The complete removal of canal contents has been the bugaboo of dentists since dentistry began. Perhaps no single operation has been more written upon, and yet with the hundreds of methods which have been described as adequate, even to-day, if a man

*For permission to reproduce Figures 3-11 the author is indebted to the *Medical Record*.

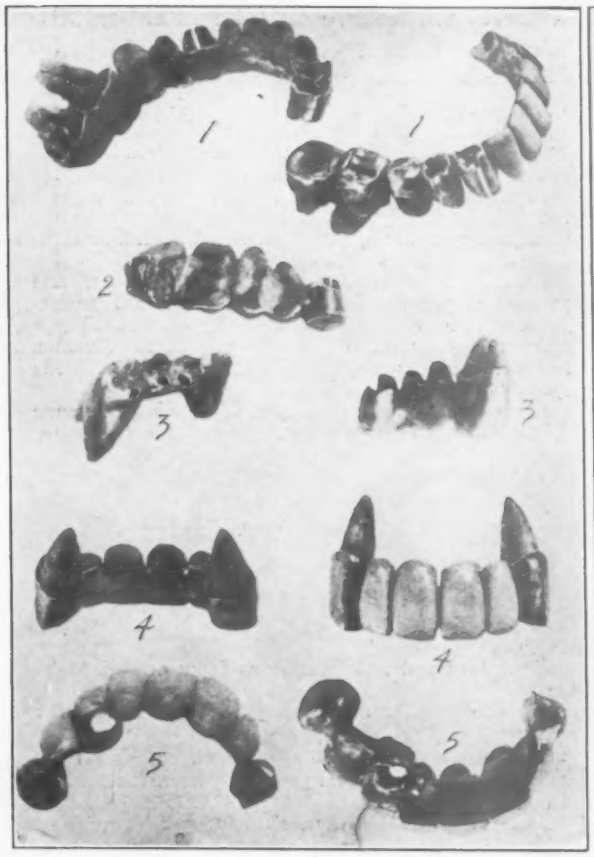

FIG. 12

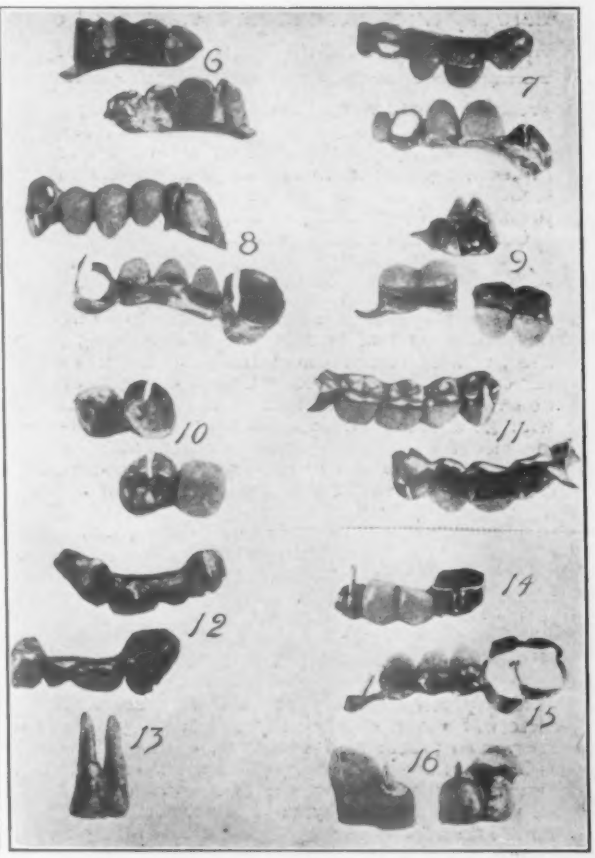

FIG. 13

PROSTHODONTIA

SPECIMENS OF WORK FROM PROMINENT MEN

These specimens are not the work of all-around incompetents: authors, clinicians, professors of prosthodontia figure among those at whose doors the existence of these specimens may be laid; men who, in some instances, are not so painstaking, that they fill the root canals of multiple-rooted teeth with gold-foil, then crown these teeth in the manner here shown, and execute the bridgework in this faulty fashion. The more carefully one examines these specimens in full detail, the firmer grows the conviction that such work is empirical and without any scientific foundation.

FIGURE 12.

Figures 1, 2 and 3 represent the aftermath of what a certain patient carried in his oral cavity, placed there by a practitioner who considers himself, and is considered by a great many, to be above the average in the skilled construction of bridgework. It will be noted that the crowns do not come within an eighth of an inch of fitting the necks of the pier teeth; that no attention has been paid to contour labio-lingually; that even from superficial examination the phonetic deficiency of the appliance must be apparent. In order to support the four lower incisors the practitioner resorted to the fixation of the entire number of lower teeth, and thus defeated his purpose and the patient's well-being by robbing all of his lower teeth of the essential individual tooth motion. The necessity for interdental space was entirely ignored, and the occlusal surfaces of the two upper pieces, right and left, show nothing short of charlatanism. The square of the surface left to accumulate filth is equal to the squares of both surfaces, labial and occlusal respectively, so that while the two latter are kept automatically clean, one by the cheeks and the other by the work of trituration, the one that cannot be automatically cleaned was made the largest in area. Why?

Figure 4. From the hands of the same master craftsman: note the quarter of an inch deficiency in the fit of what the practitioner undoubtedly called a cuspid crown. Note the lack of labio-palatal restoration, and hence interference with proper enunciation, and also please observe the final loss of the piers. Let us pass on to the next one with the thankful thought that we did not compound the felony by copartnership in the specimens so far shown.

Figure 5. Particular attention is called to Figure 5. An anterior bridge running back on the left side to the second bicuspid; on the right side ditto. From every point of view, one of the worst examples of bridgework and a foul insult to a patient's intelligence, as well as a death blow to any one's good health, constructed by one of New York's

dare say that he can reach the apices of even the majority of tooth roots, not a few of his hearers will believe that he is either self-deceived or else a wilful falsifier and a brag-

greatest porcelain specialists, actually doing work for the dental profession. It is surmised that the skill he displayed manifested itself in the addition of a little porcelain to the gingival borders of the teeth—a trap for filth and an everlasting shame for the man guilty of this product.

Compare with Figs. 10 and 11.

FIGURE 13.

Figure 6. This is shown in order to bring out the contention that bridgework, as it is being practised, is a chaotic jumble. The practitioner who is responsible for this specimen is a clinician of national reputation, when it comes to filling root canals with gold foil. The specimen shows considerable knowledge of root preparation and absolute lack of proper relation and of labio-lingual restoration. It is the half knowledge that seals the fate of a piece of bridgework, even before it is put to any test; here we find no occlusion and no evidence of knowledge of the physics or dynamics of bridgework.

Figure 7. A piece of rigid lower bridgework—may the gods forgive me for giving it the name! It shows an absolute lack of any of the knowledge with gold foil. The specimen shows considerable of this kind. Please note the lack of occlusal provision; lack of the sense of preparation; lack of interdental spaces, and pray consider that at one time there was a man who tried to collect a royalty from every man practising bridgework, for he claimed it as his invention; and then reflect upon the fact that Figure 7 is the creation, the handiwork of his first assistant. One may by an insignificant stretch of one's imagination see a blue line emanating from Figure 7, and if one look intently enough upon the blue line it will curl into the letters which make up the words, "The patient be damned!"

Figure 8. This is shown to illustrate the lack of knowledge of the simple fact that if a tooth be divided into three equal thirds, gingivo-morsally, its greatest circumference is at the gingival plane of the morsal third, and its smallest diameter at the gingival plane of the gingival third. The rest of Figure 8 is of no further interest, because it lacks anything which would entitle it to serious consideration, if it were not that it has been responsible for the development and growth of X million bacteria and the loss of a sound molar tooth. This was constructed by one who seriously takes himself as an expert crown and bridge worker.

Figure 9. This shows an intelligent (?) attempt to restore two teeth by a method of slotting the artificial fixture and running it upon a supposed-to-be paraliel bar. No allowance is made for vertical stress; none for latero-rotary stress; the labio-lingual restoration is faulty, and the method of procuring distal anchorage is mechanically unsound. Like a dutiful specimen it came back to tell of all the discomfort it had caused its proud (?) and glad (?) possessor during a period of a short six months or so. Its creator: a president of a dental something or other, a clinician of State reputation; an expert with Ascher's enamel, etc.

Figure 10. This shows a more comprehensive knowledge of crown construction and was made by a professor of prosthetic dentistry in a western institution. Presented because it exhibits the folly of attempting to obtain union between crown and dummy anywhere except upon the mesio-morsal and disto-morsal lines respectively; had this been done in the specimen here submitted the interdental space would not have been encroached upon, the area would not have become severely inflamed, and the work might yet have been in the oral cavity; though the gingival part of the facial palatal restoration was decidedly wrong.

Figure 11. A failure of the better class, and perhaps responsible for keeping this infernal bridgework alive so long. Constructed by a so-called top-notcher—yea, with an office on Fifth Avenue. Further remarks would be uncharitable. Let the specimen speak for itself.

Figure 12. A vile example of a Sixth Avenue dental fakir. This is commonly called bridgework, and while it looks "fierce," as Myra Kelly would have said, in mechanics it is no worse than a good many of the specimens submitted earlier.

Figure 13. Two Richmond crowns showing a great deal of care in construction, a knowledge of what was required, but evidently an impossibility of execution. Hence failure resulted, due directly to an ill-fitting band and consequent peridental irritation. Nevertheless, the effort of a conscientious workman.

Figures 14 and 15. Specimens from one of Hubbard's Immortals showing such a lamentable lack of knowledge that a summary of their faults will suffice:

(1) Lack of knowledge of tooth preparation.
(2) Lack of knowledge of importance of interdental space.
(3) Lack of knowledge of proportionate size of teeth.
(4) Improper labio-lingual restorations.
(5) Ignoring vulnerability of soft tissues of buccal cavity.
(6) Uncleansable area twice as large as cleansable one.
(7) The result of all the foregoing was a year of unspeakable torture for the patient, now fully restored.

Figure 16. A central and lateral incisor carried on pivot, insufficient to support one tooth, yet asked to support two. The piece shows an absolute disregard of all the rules that should govern the construction of such work, and yet the man responsible for it is a porcelain specialist of New York City, and enjoys a national reputation. If it were possible to reproduce colors in the illustration, it would show an enviable amount of ignorance of the laws that govern the production of colors; enviable, since they say that ignorance is bliss. It is needless to say that the duration of the appliance was just about the time that elapses between two rooster crows, and such is a specimen of time-honored and long-heralded porcelain bridgework.

A sufficient number of examples has been shown to compel the conclusion that the schools and colleges for dentistry are deficient, or such specimens could not exist. The methods for conveying the scientific, the accurate, the absolute in dentistry, the methods of teaching this character of work, are wrong because they are constructed upon false foundations, and no amount of trimming will bring them into plumb.

gart. Yet certainly it is high time, for the honor of American dentistry, that this attitude should pass and that root canal treatment should be as skillfully (Fig. 7) and as successfully done as are other operations, for there is nothing in dental practice of so great importance. Of what advantage can it be to a patient for a practitioner to insert a perfectly matched porcelain inlay, or a perfectly occluded gold inlay, or a marvelously constructed bridge (Fig. 10), if the canals of the supporting teeth have been inefficiently cleansed and filled?"

In November, 1909, Professor I. N. Broomell [1] said, regarding the practice of insertion of large gold fillings near living pulps, and likewise of placing of gold shell-crowns without removal of the pulp (Fig. 11), as follows:

"As a result of the microscopic study of a number of cases, it is proposed to show that almost invariably the pulp tissue, and as well the enamel, dentine, and alveolo-dental membrane, are all more or less affected in various ways by such unnatural surroundings. Among the morbid effects produced are hyperemia of the pulp, dry gangrene of the pulp, calcification of the pulp tissue, sclerosis of the blood-vessels of the pulp, atrophy of the pulp, pulp nodules, secondary dentine, expansion of the dentinal tubules, with corresponding bulging of the dentinal fibers, pathologic pigmentation of the enamel and dentine, non-carious destruction of the enamel, as well as destruction by caries and perhaps a molecular change in this tissue. Any one of the foregoing may be the primary affection, after which a train of pathic conditions may ensue."

In 1910, covering the matter of mechanics and practice of bridgework, Dr. Herman E. S. Chayes [2] writes:

"At best one is brought face to face with results that are unsatisfactory, incomplete, unwholesome and unclean, etc., etc. These specimens (see Figs. 12 and 13) are not the work of all-around incompetents; authors, clinicians, professors of prosthodontia, figure among those at whose doors the existence of these specimens may be laid."

As further proof of the attitude of the progressives of the dental profession, Dr. R. Ottolengui's editorial comment on the above closed as follows:

"It is not the writer's intention to leave the impression that such evils as are here described are representative of typical American dentisty. Quite to the contrary, no one better than he knows that perfectly scientific, thoroughly aseptic, and entirely sanitary dental operations (Fig. 7) are done daily by thousands of dentists in this country. Yet it is likewise true, and pity 'tis that 'tis true, that thousands of other dentists do exactly that sort of work which Dr. Hunter so aptly terms 'septic dentistry.'

"Perhaps the great underlying reason of this may be found in the fact that neither the surgeon, the physician, the dentist, nor the patients themselves fully realize the dangers that threaten the whole body if the oral cavity be a secret storage place for 'oral sepsis.' When the people come to understand that their very lives depend upon sound teeth in a clean and healthy mouth, then, and not till then, will they cheerfully pay an adequate fee for competent dental service, and in that day more dentists will practice, because they can then afford to practice thoroughly 'aseptic dentistry.'"

Nor has anything materially different been said on the subject of dying or dead pulp, root canal fillings, gold or porcelain fillings or inlay work, crown, or bridge work. These men were pathfinders. Their colleagues have been stumbling or speeding along the way, as the custom has been and always will be. Mistakes were made, which is the point that concerns the medical profession.

The period of the dark ages in dentistry began propitiously enough when carious teeth were saved by fillings (Fig. 14). But soon mechanical dentistry became so ambitious that the dentist began to regard the loss of a tooth as the physician does the death of a patient. Their patients, even

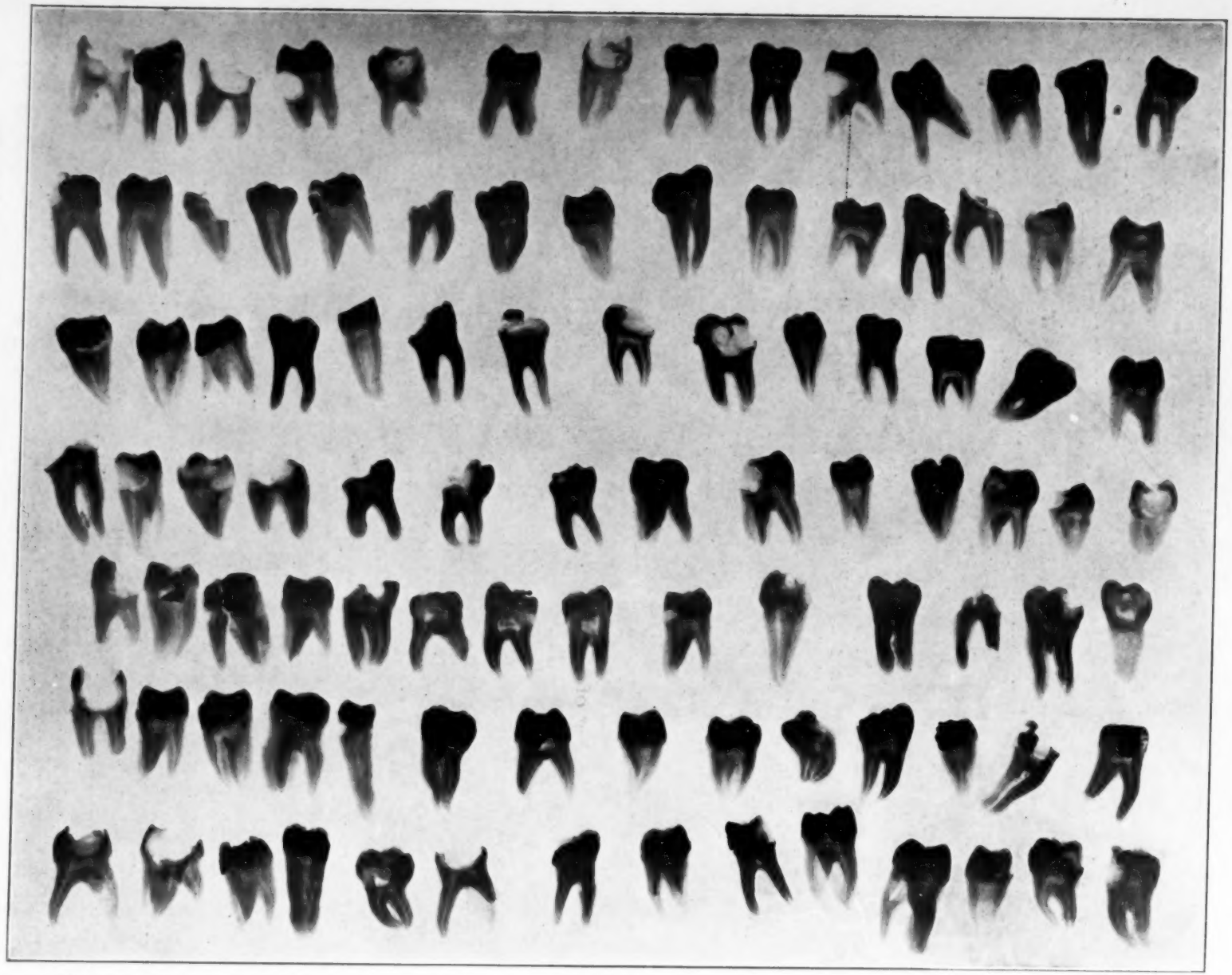

FIG. 14. Note how the roentgenogram reveals the universal lack of proper root canal filling in teeth taken at random from the offices of an extractionist in New York. Scientific root canal work in time would have saved almost all of these teeth for years of use. Compare with Figs. 3, 4, 5, 6, 7, 8 and 9. (By courtesy of Dr. W. H. Haskins.)

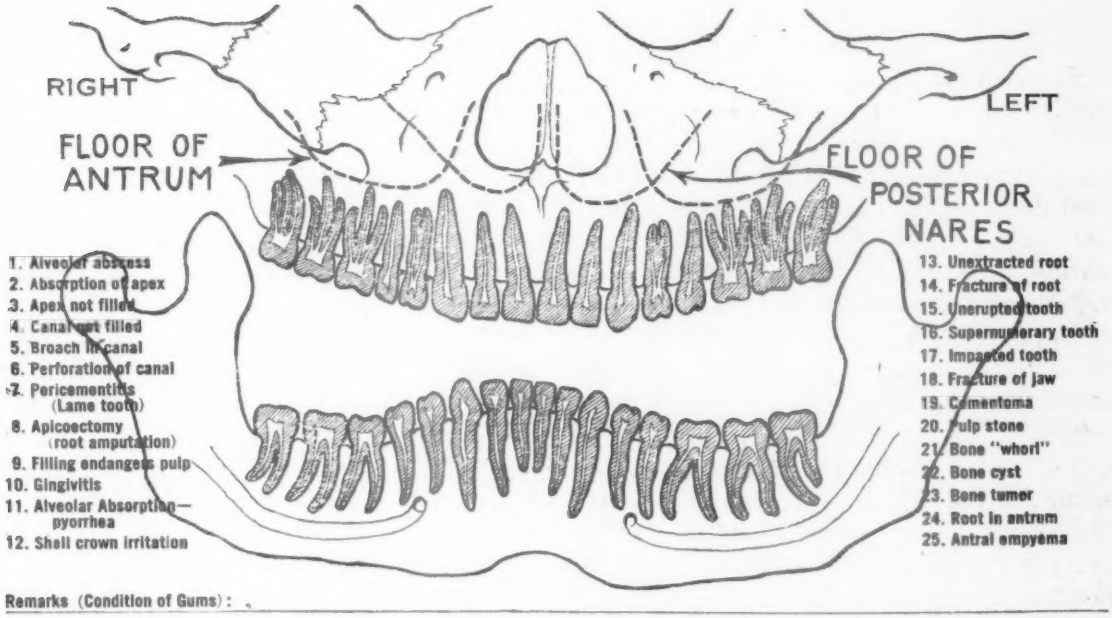

FIG. 15. The Dental Chart, a 4 x 6 inch card in two colors for diagraming the composite *x*-ray findings, makes graphic and definite record for the physician and dentist and saves time. The diagram itself is in red ink and the findings are drawn in with black India ink.

sensible men and women, by the same token grew so vain that the loss of a tooth was a shock and forewarning of approaching dissolution.

In any roomful of adults, such as this, it is the exception if any mouth has not at least one pyorrhea pus pocket, or blind or fistulous alveolar abscess. Nor can children, with their carious and dead temporary teeth, be excepted. The radiograph visualizes the destruction caused by oral sepsis. The best dentists admit its existence and are striving by every means at their command to remove and remedy the mistaken technique of the past and by perfecting their technique to avoid it in the future, at the same time advising prevention as worth more than cure.

It is my purpose, in as few words as possible, to take up the practical matter of the scope of the report that I make, one copy of which I send to the physician for his files, and one copy of which I send to the dentist. The films are also made in duplicate, one set being kept on file, and the other sent to the physician, who may give them to the dentist for his guidance. Lately I have had a chart made (Fig. 15) on a four by six card, which I have had passed around, hoping by this graphic means to save time in making a report and to give a better guide to the dentist or physician. On this chart one can draw a composite of several films taken at different angles.

Sooner or later in doing this work, the roentgenologist is likely to be called upon by the physician to give advice as to the need of extraction, etc., and to explain dental procedures to correct the given condition. To do this, one must become well informed as to the practices of old as well as of modern dentistry. For that reason I have given you quotations from the works of the dentists themselves. It is well to read the dental journals, which are now full of this subject, in order to keep abreast of their work.

In cases of pyorrhea (Figs. 8 to 11), in connection with some serious systemic condition or incapacitating arthritis, for example, thorough extraction must be considered, first taking several cultures for autogenous vaccine treatment. In all cases, faulty long

pare with Figs. 3, 4, 5, 6, 7, 8 and 9. (By courtesy of Dr. W. H. Haskins.)

shell crown and fixed bridgework (Figs. 12 and 13) should be removed and replaced by that which can be kept clean.

A loose tooth, if there is enough sound and healthy alveolar process left to hold it (Fig. 10), must have all the lime deposits scaled off frequently. The Emetin Treatment should be considered, although it is variously criticized, as the end-amœba is only one of the one hundred and fifty bacteria present. The diet should be carefully considered along present-day findings. Meat-free and similar diets were strongly advised at one time, on the ground that the condition is systemic and metabolic, not local, and that herbivorous animals are free from pyorrhea. Many of these cases resist every treatment, and extraction is finally necessary.

In cases of blind or fistulous alveolar abscesses (Figs. 6 and 7) the procedure is even more complicated, and action should be more or less radical depending on the patient's condition.

Too many root canals were never emptied or filled. Canals filled with so-called antiseptic cotton do not show in the radiograph. They should be condemned and the filling removed in all cases. Paraffin fillings do not show in a radiograph, but if there is an apical lesion the canal should be emptied. Gutta-percha, either alone or combined with a metal, is more commonly used and shows well in the radiograph (Fig. 7).

There are three ways of treating an apical abscess which have supplemented the old method of emptying the canal, draining it with wisps of cotton, and injecting antiseptics until such a time as healthy granulation shall have replaced the abscess cavity. This method requires a large canal opening, and in the lower jaw, with gravity opposing, the drainage is doubtful.

The first of the newer methods, which is advocated by Dr. M. L. Rhein and claims good results, requires ionization with antiseptics. It would seem surgically possible, however, to empty the canal and, after a short period of drainage, to refill it aseptically solid to the apex, first checking the procedure by radiographing the tooth with wires in place (Fig. 7) to show that the apex was opened and emptied, and again radiographing it to determine whether the opaque filling is flush with the apex. Thus, the blind pocket in the apical canal being obliterated by the filling, healthy granulation should take place, and callus and bone repair follow (Fig. 7).

Second, when a canal cannot be emptied or filled to its apex on account of curves, or when it has been accidentally perforated, the unfilled portion may be amputated through the alveolus and the wound repacked over a long period until the usual repair takes place.

The third method, which I would emphasize, is extraction. Whenever this is advisable a careful culture should be made of the tooth apex and socket on blood serum for an autogenous vaccine, for the culture if lost can never be regained. If not needed immediately some later exacerbation of the patient's condition may indicate its use.

In calling the physician's attention to these details of oral conditions, it is not my purpose to wade too deeply into the waters of dentistry, but rather to impress upon your minds that by comparatively simple procedures of dentistry urged upon the patient in time, the physician may be spared much anxiety and the patient may be greatly benefited.

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INTERPRETATION OF DENTAL ROENTGENOGRAMS*

BY R. OTTOLENGUI, D.D.S., BROOKLYN, N. Y.

AT this time, more than ever before, do we need the most expert reading of radiographs of the teeth and jaws, for while it is true that few real experts already exist, and also that many dental practitioners misread radiographs, it is more true that a still smaller number of medical radiographers can correctly interpret a dental radiograph.

The above fact is constantly increasing in importance because in these days, when so many systemic diseases are attributable, or at all events attributed to the infections about the roots of teeth, the routine results disastrously for the patient. In the presence of a case of arthritis, for example, and especially when accompanied by an endocarditis, the physician not unnaturally sends his patient to his regular radiographic specialist, a medical man. At times, only a large head picture is taken. At others several dental films, made intra-orally, are also obtained. Almost invariably radiographs are made of perfectly healthy teeth, in absolutely normal environment. For these useless pictures, which disclose what could be seen with the naked eye, viz., that the parts are in a state of health, the patient must pay.

But this extra expense to the patient is the least of the evils. Many medical radiographers, not only uselessly radiograph such areas, but unfortunately they not infrequently read disease into parts that are entirely free from pathological disturbance of any sort.

The writer is seeing pictures of this sort with increasing frequency. From all parts of the country dentists are sending radiographs of teeth condemned by medical radiographers, which their own consciences will not permit them to extract on such demand, without first consulting with some other dentist. Usually the medical expert (sic?) reads as pathological any so-called "rarified" area. Any spot on a dental film which shows dark is at once marked with little arrows in pen and ink, and declared to be a focus of infection.

Two films recently seen, one from the far South, and the other from the middle West, had such arrows pointing from three directions to the region of a tooth socket, from which the tooth had been removed years before. The so-called rarifaction in these cases is not pathological, being due entirely to the fact that the tooth socket has been built in with bone which is more cancellous

*Published simultaneously in the *Dental Items of Interest.*

and therefore less resistant to the ray than the surrounding or adjacent tissues.

Abscesses have been diagnosed between perfectly sound and healthy upper central incisors, when the shadow was due entirely to a large palatine foramen. In similar fashion medical arrows point out abscesses on lower bicuspids in the region of the mental foramen. Sometimes molar roots are said to be emptying pus into the antrum, when in truth they are alive and merely seem to enter the antrum, because of the shadow cast by the lower border of the malar bone.

Another medical gentleman marked as serious two large densely dark, and therefore much infected (sic?), spots lying over the two upper lateral incisors. The patient was suffering from a slight attack of articular rheumatism, and the physician sent the woman promptly to her dentist for extraction of these two teeth. The woman not unnaturally balked at the idea of losing two upper lateral incisors, neither of which had ever been even filled. Her dentist upheld her, but as he was a young practitioner, and the physician was a prominent man, and the rheumatism was undoubtedly present, he brought his patient and the medically made radiograph to the writer for consultation. An examination of the mouth showed immediately that the teeth were seemingly healthy, and certainly vital. Yet, of course, we do have abscesses on vital teeth. From a close study of the radiograph, it was soon noted that the two abscesses (?) were singularly symmetrical and similar in conformation and density. Presently the problem was solved. The woman had a large nose with widely distended nostrils. The film used was one of the larger kind placed in the mouth horizontally, lying in the occlusal plane. The ray had been introduced high up and cast a much distorted shadow of the tip of the nose upon the film, the large nostrils allowing the passage of more light and thus causing two dangerous abscesses (?) on the lateral incisors.

The writer would not convey the idea that there are no medical radiographers who can correctly read dental films because there are many who can. Nor would he leave the impression that any dentist who has recently purchased an *x*-ray outfit is better qualified to interpret radiographs of the jaws, because he is not. Indeed quite as serious blunders have been made by dentists, and even by dentists posing as radiographic experts, as by medical radiographers.

The point to be emphasized, however, is that teeth should not be sacrificed upon the evidence of a radiograph alone, and without due consideration of the clinical history, unless the radiographer has sufficient acquaintance with pathological conditions in the mouth, and radiographic pictures thereof, to render his opinion valuable. Other things being equal the radiodontist, or dentist practicing radiography, should prove more reliable than the medical radiographer.

There is urgent need for good treatises on the interpretation of dental radiographs, and such papers should be published in the medical as well as in the dental journals. The subject cannot be further considered in the space available here. But this may be stated as an irrefutable dogma. *The radiograph is not a picture of disease. It is a record only of the varying resistance to the passage of the ray offered by the parts pictured.* The interpretation of the meaning of these shadows, and a decision as to whether they are caused by pathological conditions or not, require on the part of the radiographic diagnostician a full knowledge of the clinical expressions of the various affections, and of the varying shadows cast in consequence thereof.

In our own field then let us welcome and encourage the radiodontist, as the man who will most competently stand between the medical practitioner and the dentist, and more particularly between the physician and the exodontist. We cannot too rigorously condemn the extraction specialists who remove without question any tooth indicated by an arrow marked on a dental film.

THE APICAL SHADOW

BY GEORGE M. MACKEE, M.D., NEW YORK, AND JOHN REMER, A.M., M.D., NEW YORK.

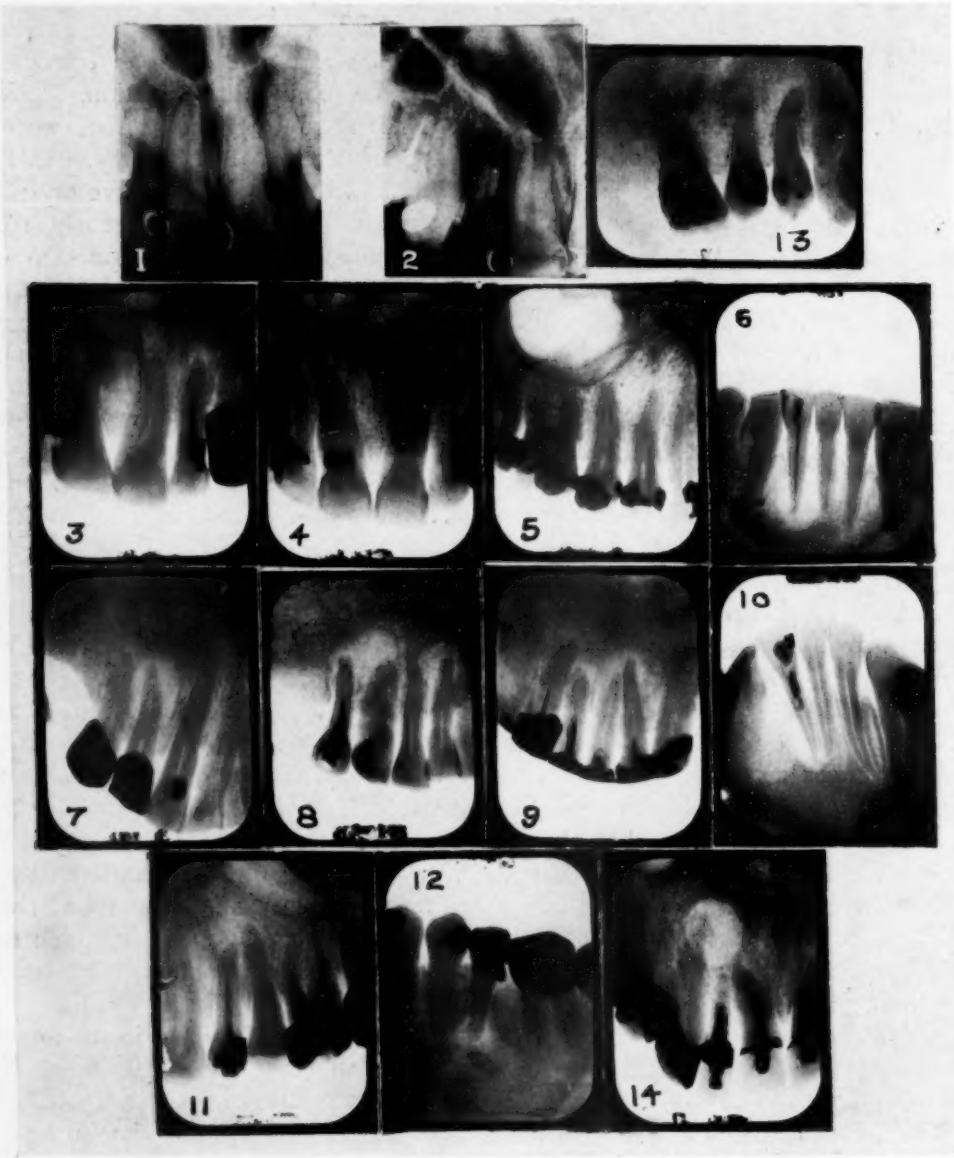
A DARK shadow, in the roentgenogram, around the apex of a tooth means, naturally, that at this particular portion of the alveolus there is a lessening of density, increased permeability, less obstruction to the passage of the ray or less absorption of ray. Inasmuch as it is the calcium salts in bone that produce the shadow on the photographic plate or film, the dark apical shadow would obviously indicate a loss of lime salts—in other words decalcification. Now what does decalcification of the alveolus in the immediate vicinity of the apical extremity of a tooth signify from a clinical or dental standpoint? It may mean the result of infection, usually from a dead tooth, unless, perchance, we are dealing with a blind abscess.* If, therefore, the possibility of a cyst or pressure atrophy can be excluded, and such differentiation is seldom difficult, the shadow would indicate that a tooth had become devitalized, putrescent and that pathogenic microörganisms had passed through the apex and infected the alveolus. Such a diagnosis, however, should not be made by the roentgenologist because the shadow may indicate a blind abscess and the tooth itself may be healthy. In all apical shadows that are associated with a tooth possessing a patulous pulp canal—one that contains no impervious filling—the roentgenologist should call attention to the shadow and suggest the possibility of a dead tooth. The dentist will then, if he had not previously done so, apply appropriate clinical tests to determine whether or not the tooth is dead. Occasionally the apical shadow is the first sign of a dead tooth, and at times such a tooth fails to respond to clinical tests either positively or negatively, but as a rule the roentgenologic and the clinical or dental findings combined will elicit the required information.

Not infrequently a dentist, who is not experienced in roentgenology, will locate a dead tooth by either objective or subjective symptoms and will be greatly surprised when the roentgenogram fails to demonstrate any abnormality. The explanation, of course, is simple. The infective process may not have involved the alveolus or if it has the amount of decalcification may be so slight as not to be noticed roentgenologically. The following question is often asked by dental surgeons: how soon after apical infection can the change be noted in the radiograph? The answer will be: as soon as decalcification occurs. And this I assume will depend largely upon the virulence of the microörganisms and upon the vitality and resistance of the tissues. At times it is possible to detect decalcification as soon as the subjective symptoms are noticed—at other times the tooth and alveolus appear roentgenologically normal for some time after the onset of subjective symptoms. It is necessary to utilize considerable caution in interpreting very slight apical shadows. Anatomical shadows, photographic defects, artifacts and overlapping shadows must be carefully excluded. The overlapping shadows from the antrum in the case of the superior molars, the foramen of the inferior dental canal in the case of the lower bicuspids and the nasal cavity in the case of the superior central incisors may simulate apical shadows. If, however, an apical shadow persists throughout a series of roentgenograms taken at different angles, it should be viewed with suspicion and reported to the dentist.

Now comes the important questions: does an apical shadow indicate the presence of pus and does it indicate a cavity in the

*See article by Thomas B. Hartzell entitled, "What Shall We Do with Pulpless Teeth?" and published in *The Dental Review* for February, 1916.

alveolus? If there is a very dense shadow with complete loss of bone detail a cavity exists, but in the majority of instances, where there is simply a more or less well-marked, dark shadow containing bone detail, it is extremely unwise to assume that a cavity exists. The shadow simply indicates decalcification and there may be or



Figs. 1 and 2. In Fig. 2 there is what appears to be an abscess at the apex of the left central. Fig. 1 shows the same central with normal bone at its apex. The apparent abscess in Fig. 2 was caused by the apex being overlapped by a shadow from the nasal cavity. There is considerable decalcification around the apex of the lateral with some absorption of the apex. This is not depicted in Fig. 1 as well as in Fig. 2 on account of the angle.

In Fig. 3 there is a suspicious area at the apex of the right central.

Fig. 4 shows this to have been an artifact. There is a little true decalcification around the apices of the left central and right lateral.

In Fig. 5 the shadow above the first molar is the antrum and not an abscess.

The central in Fig. 6 developed a severe apical abscess. This was treated for many months, after which there was no clinical evidence of disease. The roentgenogram at this time shows either that there is a cavity or that the space is occupied with new-formed tissue not possessing much density.

Fig. 7. Here we have a tooth that is capped or crowned and whose pulp canal contains no imper-

there may not be cavity formation. In regard to pus such shadows do not by any means indicate its presence. It is extremely risky for the roentgenologist to assume the presence or absence of pus. This should be left for the dentist to ascertain. To illustrate this point, let us assume that we have a roentgenogram showing a well-marked apical shadow. The subjective symptoms indicate an apical abscess. The tooth is opened, drained and treated for many weeks —until the parts are clinically normal. The tooth is then filled with a permanent filling. Several years pass without symptoms. At this time another roentgenogram is taken, it is very likely to show an apical shadow—not as marked, perhaps, as at first, but still present. The point is that an apical shadow simply signifies decalcification from any cause. It may represent a slow change, such as atrophy or absorption from long-continued irritation or pressure; it may mean an acute infective process or it may simply signify the remains of former trouble—scar tissue. It will be obvious that the roentgenologist, in order not to mislead the dentist, should be cognizant of the foregoing possibilities and should be very conservative in his interpretation.

Not infrequently dentists will have their apical cases examined roentgenographically at various times during the treatment in order to ascertain the amount of improvement. Such a procedure has its value which, however, is considerably over-rated. The modification of the shadow will depend very largely upon the deposit of lime in the scar which, after all, is not so very important. It will also depend upon the technic. A shadow can be made lighter or darker, smaller or larger, by varying the exposure, the quality of the ray, the depth of development, the photographic emulsion, the developer, the angle, etc.

In the last few years the medical profession has become much interested in a fact long known to dentists, namely, that improper dental hygiene leads to pus formation which in turn may prove to be the cause of numerous systemic diseases. For this reason the roentgenologist is frequently called into consultation to locate or exclude pus production in the alveolus. Proper roentgenography in such instances is of the utmost importance, but the examination must include the entire alveolus of both the superior and inferior maxillae and the apex of every tooth. And in accordance with preceding remarks considerable caution must be exercised in the interpretation. Because of mistakes made by dentists many physicians pin their faith on the roentgenologist. On the other hand so many mistakes have been made by roentgenologists that many dentists prefer to depend upon their own clinical findings. It would seem advisable for such patients to be examined by both a skilled dentist and an expert roentgenologist—the observations of one controlling those of the other.

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vious filling. The apex is surrounded by decalcification. This shadow might represent a beginning abscess or the innocent remains of former trouble.

Fig. 8. Multiple areas of decalcification. The central is unfilled, so it is possible there is an abscess. The same is true of the cuspid. The bicuspid contains filling, so that the apical shadow here may represent an active process or scar tissue.

Fig. 9. Multiple areas of slight decalcification which from a radiographic standpoint may represent active or inactive processes. Note that the pulp canals contain very little impervious filling.

Fig. 10. Shadows indicating present or past trouble.

Fig. 11. Slight decalcification around apices of both bicuspids. First bicuspid is filled, so shadows may be remains of former abscess. Would not pronounce death of second bicuspid without clinical confirmation, as shadow may only appear to involve the tooth.

Fig. 12. Decalcification around an apparently live tooth. Filling is very close to pulp, so tooth may be dead. There is also always the possibility of a blind abscess. The dental and roentgenologic findings together usually solve the question.

Fig. 13. Very faint but fairly extensive shadow at apex of first bicuspid. This may be an artifact, an anatomical or pathological shadow. It may signify a beginning abscess and a dead tooth or a blind abscess with a live tooth.

Fig. 14. On account of the shape and sharp margin the shadow involving the apex of the cuspid is probably a cyst instead of an abscess. The dental diagnosis is blind abscess.

DEPARTMENT OF LABORATORY NOTES

EDITOR, DAVID R. BOWEN, M.D., PHILADELPHIA, PA.

AN ILLUMINATING DEVICE FOR DENTAL FILMS

BY M. WILLIAM CLIFT, M.D., FLINT, MICH.

ONE of the many inconveniences in the handling of dental films is the lack of an illuminating device which will hold the film securely and at the same time can

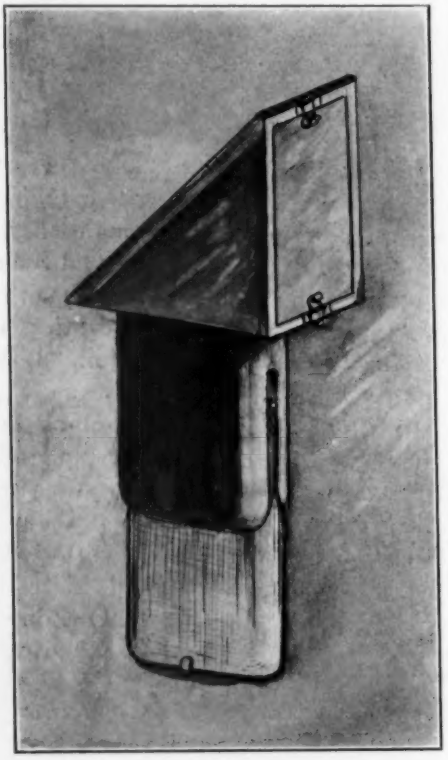

FIG. 1.

be conveniently held in the hand for study.

The instrument here illustrated was designed by the writer for his own use, and it has been very satisfactory in operation. It consists of a sheath which fits over the ordinary flash lamp and a diffusing box in the front of which is fitted a small sheet of frosted celluloid and a supporting sheet of thin glass. The sides of the diffusing box form a right angle triangle, the back acting as a reflecting surface for the light which enters through an opening in the bottom. A frame, slightly larger than the No. 1 size dental film, forms the front of the box and

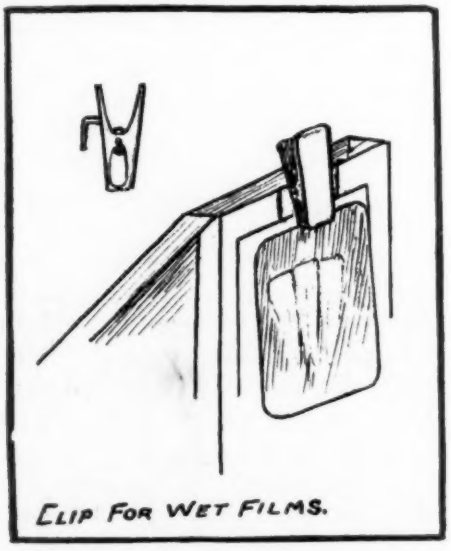

FIG. 2.

permits the diffusing glass to be removed for cleaning.

As indicated in the cut (Fig. 1), small adjustable clips firmly secure the film in place. Wet films can be safely examined with the instrument as there is practically no heat generated and for this purpose a small spring clamp (Fig. 2) replaces the upper clip and holds the film away from the glass. The frosted celluloid sold by photo supply dealers as a substitute for ground glass gives almost perfect diffusion and as the grain is nearly imperceptible is quite as satisfactory as opal glass for this purpose. Its use, likewise, reduces the bulkiness of the apparatus no small amount.

The material used in the construction is thin sheet brass. The interior is enameled a flat white and the exterior is finished in mat black to reduce reflection.

The device is particularly well adapted to the demonstration of films to the dentist, as it permits them to be thoroughly examined without undue handling and consequent injury. It is independent from any electric light supply, and convenient in size.

A SYSTEM FOR HANDLING DENTAL FILMS*

IN examination of the teeth, Dr. Manges and the writer have for some time past used the method which was described by Dr. A. M. Cole at the 1915 meeting of the American Roentgen Ray Society, using 10 small films. These are mounted, as per Fig. 1, between two 5x8 plates and sent to the dentist, a lantern slide being kept for record.

As the work began to accumulate it became increasingly difficult to prevent "mix-ups" and, on several occasions, it was necessary to see the patient again to be sure

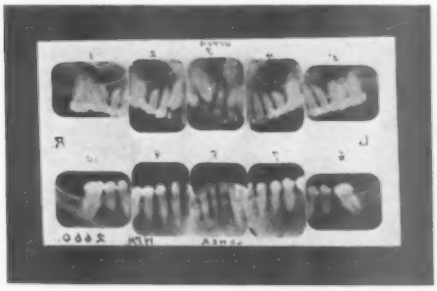

FIG. 1.

as to position of one or more films. Since I devised the holders here described, such error is easily avoided. The holder (Fig. 2) consists of a sheet of brass 2½ inches wide by 5½ inches long, bent over on one end to hang over the "Core" frame in the developing tank. On the other end are soldered two clips, modified from Dennison's No. 14 Card Holder. As purchased, these have two symmetrical jaws as in A (Fig. 2). One of these I cut to a sharp V-shaped point, as in B (Fig. 2). This is applied to the emulsion side, where it makes a barely noticeable defect. Ten of these clips, numbered from 1 to 10, are used for each patient; and as each film is exposed it is, still in the original paper wrapper, clipped into the holder numbered to correspond with the position in which the film was exposed. (See Fig. 1.) When the 10 exposures are made the entire set is removed to the de-

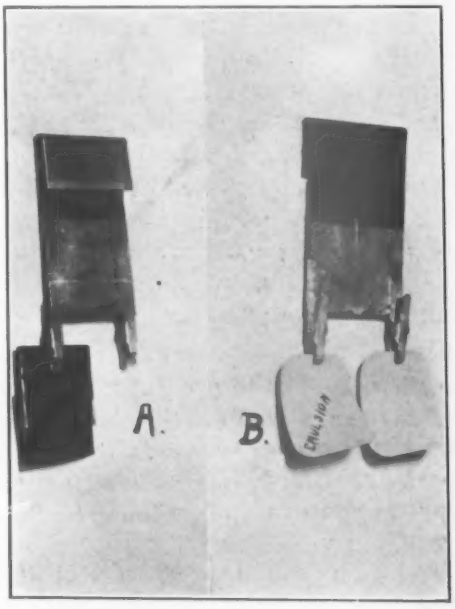

FIG. 2.

veloping room and, as each package is unwrapped, the two films are returned to the same holder. They are then developed, fixed and dried (Fig. 3) without removing. Mounting in proper order is, of course, easy. If more than one patient is examined the second and third, etc., are easily identified by pencil marks on the holders.

For a time, difficulty was experienced in mounting between glass because of the per-

*These were demonstrated by the writers at the midwinter meeting of Roentgenologists, Atlantic City, January, 1916.

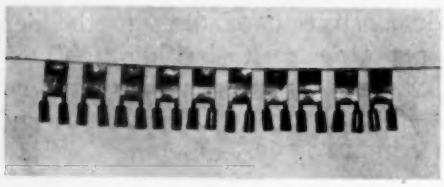

FIG. 3.

sistent curl of the film. This may be quite overcome by another device (or ten of them). Wooden meat skewers were cut in 2 inch lengths and to each piece was glued one end of a paper strip, 2x6 inches. If these are rolled up like a scroll it is easy to roll in the film, turning it so as to reverse the curl. When rolled, secure with a rubber band. These are numbered to correspond with the clip holders. Even if one works quickly, it will be found that by the time No. 10 is rolled, No. 1 can be taken out quite flat.

However, we have found, after more practice, that it is quicker to mount them without removing the curl, and have discarded the rolls. D. R. B.

One of the most annoying details in dental examinations with small films is the liability of slipping, either on the gum or under the patient's fingers, due to moisture of the paraffined paper. This can be quite obviated by first wrapping the package in white tissue or parchment paper.

W. F. MANGES.

Protection Against Puncture of the Coolidge Tube. By George E. Pfahler, M.D.*—Having punctured three Coolidge tubes by a spark leaping from the aluminum filter underneath the tube, necessity forced me to devise the following: A circular piece of negative glass from which the emulsion has been removed is placed above the filters so that they can in no way be attracted to the bulb, and so as to prevent a spark leaping from the aluminum to the glass bulb. In the tests that we made, it was found that a layer of this glass corresponds to two millimeters of aluminum in filtering value. This will vary, of course, with the thickness of the glass used, and should be tested out by each individual. This is inexpensive, gives a filtering value, and will absolutely prevent puncture from such cause.

Automatic Distance Finder for Therapeutic Work. By George E. Pfahler, M.D.*—Since the value of the rays varies inversely with the square of the distance, it can be understood that to secure accurate and constant results, the measurement of the distance of the target from the patient must receive the greatest attention, and unless this is done, surprises and disappointments will follow. Since one very quickly settles to a definite and uniform distance, and since the distance between the target and the tube and the location of the filter is constant, it becomes a simple matter to measure the distance between the filter and the skin of the patient by simply attaching a transparent black bead to a silk string fastened to the center of the lower filter, and the length of this string adjusted so that the target will be located at the exact distance required from the patient. Then, when the tube is lowered so that the bead just touches the skin, we will have the exact distance required. One must bear in mind, of course, the irregularities that are encountered when, of course, the danger point is the nearest point of the skin. In my work, I use, in general, a distance of eight inches from target to skin. The bead is therefore adjusted so that it is exactly eight inches from the target.

*These were demonstrated by the writers at the mid-winter meeting of Roentgenologists, Atlantic City, January 1916.

DEPARTMENT OF TRANSLATIONS AND ABSTRACTS

EDITOR, JAMES T. CASE, M.D., BATTLE CREEK, MICH.

ELS, Bonn: Anomalies of the Sacrolumbar Region in the Roentgenogram and Their Clinical Sequelæ. (*Beitr. z. klin. Chir.*, Vol. 95, No. 1, p. 125.)

Els has paid special attention for two years to the roentgen findings of the sacrolumbar region in patients with chronic sacral pains, and found many changes capable of explaining the complaints. There were two cases of spondylolisthesis in men. He next discusses the more frequent spina bifida occulta, i.e., the more or less pronounced cleaving of the fifth lumbar or first sacrovertebral arch. Els has seen such fissures five times at the fifth lumbar vertebra, eleven times at the sacrum and three times at both. He believes that this cleft, even when uncomplicated, may cause certain complaints, 8 out of 11 patients having had pain at the exact place of the clefts. These complaints are explained by pressure on the meninges on the part of the vertebral arches, which in such cases run an abnormal course, or by the abnormal bands which are not infrequently formed in these cases.

When there is cleavage of the sacral arch, there is always a so-called independent lumbalized sacral vertebra, a condition which is also observed without any fissure formation, and may by itself be sufficient to produce complaints. The cord formations which are so often observed in spina bifida occulta may lead to complaints and even paralysis. Els takes this occasion to mention the pathological history of a 45-year-old woman who was operated upon for a true meningocele, and cured.

Spina bifida occulta is often complicated by abnormal enlargement of the lateral parts of the affected vertebra, and as the basal transverse process is particularly involved in this enlargement, it may very well exert pressure on the nerve roots.

Hyperplasia of the transverse processes of the fifth lumbar vertebra also occurs without spina bifida. The pathological significance of this abnormality depends upon how far the enlarged transverse processes approach the lateral parts of the sacrum permanently or in a certain attitude. There may be a bursa between the two points of contact, giving rise to bursitis. Or an actual articulation may develop which, owing to incessant use, may become the seat of arthritis deformans. Sometimes the foramen intervertebrale is so closed in that ischiadic complaints may result from pressure on the lumbosacral trunk. The extreme of abnormal connections between the last lumbar vertebra and the sacrum is formed by the so-called sacralization of the lumbar vertebra. Three of the author's cases show that this manifestation, especially when unilateral, likewise causes pressure upon the trunk with resultant pain.

Els has observed these malformations of the transverse process especially in men of the laboring class between 30 and 40 years of age.

All these cases, when of long duration, accompanied by severe pain and not yielding to symptomatic therapy, must be operated upon.

In conclusion, the author reports a case of forward dislocation of the fifth lumbar vertebra. The article is illustrated by 27 roentgenographic reproductions.

PERUSSIA, F., Milan: Phosphorus Necrosis of the Maxillæ. (*La Radiologia medica*, 1914, No. 8. Ref.: *Zentralbl. f. Roentgenstrahlen*, Vol. VI, Nos. 7 and 8, p. 267.)

The author made roentgenological observations in nine cases of necrosis of the inferior maxilla, due to phosphorus poisoning, and concludes the following: The roentgenological picture of phosphorus necrosis of the maxillary bones is identical with that of an ordinary chronic osteomyelitic process of these bones. But if in an individual case the etiology is to be determined, the absence of dental alterations in the roentgenogram is of great importance. Positive findings of dental alterations

The Abstract Editor is indebted to the *Zentralblatt für Röntgenstrahlen, Radium und verwandte Gebiete* for material aid in the production of abstracts of many of the foreign articles.

are of less significance, because they do not exclude phosphorus. The roentgenological findings favor the theory that the etiology of maxillary phosphorus necrosis is to be found in the elective effect of phosphorus on the bone tissue in general and on the maxillary bones in particular.

Gross, W., Hamburg: A Method of Fixation of the Liver in the Hepatoptoses and the Determination of the Extent of Gastroptosis. (*Deutsch. med. Wchnschr.*, 1915, No. 16, p. 460.)

The author distinguishes between three degrees of gastroptosis. The first degree is descent of the pyloric region (antrum) or of the greater curvature of the stomach down to the umbilicus; the second degree indicates the position of the middle of the antrum or stomach at the level of the umbilicus, and the third degree signifies the position of the antrum or stomach entirely below the umbilicus or in the pelvis. (Question: How were these patients examined, erect or supine?—Ed.) The third degree nearly always demands operation. Drawing together of the hepatogastric ligament was rarely done, the method most frequently employed having been the utilization of the hepatic ligament for the ligation of the pylorus and elevation of the stomach in posterior gastro-enterostomy.

Ponzio, M., Torino: Determination of Operability in Roentgen Examination of Gastric Carcinoma. (*La Radiologia medica*, 1915, No. 1. Ref.: *Zentralbl. f. Roentgenstrahlen*, Vol. VI, Nos. 7 and 8, p. 268.)

The usefulness of a roentgenological examination in every suspected case of gastric lesions is beyond a doubt. The roentgenoscopic study should be systematic. There are cases in which even the most careful examination is unable to diagnose gastric carcinoma with certainty, but there are also numerous cases where not only incipient neoplasms but also tumors disseminated over the entire gastric wall can be diagnosed, although Erlini's symptomatology is a partial or total failure.

The diagnosis of initial gastric carcinoma is based on a complex roentgenological symptomatology, the interpretation of which is often difficult. A roentgenological examination cannot establish with absolute certainty the presence or absence of a small initial neoplastic lesion of the pyloric part or lesser curvature. The difficulties increase in a stomach with previous ulcerous processes, the nature of which cannot only not be recognized by direct examination at the time of operation, but can only be placed with difficulty in histological examination. A callous ulcer may simulate a typical neoplasm by volume, extent and adhesions, without possessing the pathologic and anatomic character of such. In these cases the roentgenological findings of changed peristalsis, incomplete filling, etc., do not admit of an absolute differential diagnosis, but furnish valuable pointers for the indication of a radical operation. But the value of a differential diagnosis in regard to operability should not be overestimated, as nowadays there is a tendency in view of the closer relations between callous ulcer and carcinoma (Stromayer) to use the knife in all suspicious anatomical alterations of the gastric wall which have the characteristics of a chronic ulcer so as to avoid the possibility of neoplasms (Fayr, Riedel, Bastianelli and others). The exact seat, volume and extent of the lesion should be determined and also whether there are extensive adhesions or infiltrations contraindicating total resection, and whether there are any concomitant lesions of the neighboring organs such as liver, pancreas, etc. The roentgenological examination also furnishes valuable indications as to the nature of certain neoplasms, as for instance in scirrhous carcinoma, where the clinical findings often do not admit of determining the form and extent of the lesions. Here roentgenology will perform the same service as an explorative laparotomy.

The author discusses the various forms of gastric carcinoma and the corresponding roentgenological findings.

Perussia, F., Milan: Technic of Roentgenography of the Intrauterine Fetus. (*La Radiologia medica*, 1914, No. 5. Ref.: *Zentralbl. f. Roentgenstrahlen*, Vol. VI, Nos. 7 and 8, p. 271.)

The intestine, the bladder and the stomach are to be evacuated prior to roentgenoscopy. The position of the patient and the direction

of the rays depend upon whether the position of the fetus, relation between the size of the fetal head and dimensions of the pelvis, or the conformableness of the pelvis, etc., is to be determined, or whether it is desired to know whether there is pregnancy at all, whether there is a single or multiple pregnancy, whether there are skeletal abnormalities of the fetus, whether there is a living fetus, etc. In the former case, the best plan is to make a sagittal projection which should be anteroposterior in case the greatest interest of the picture centers upon the fetus; and posteroanterior if the maternal pelvis commands the greatest interest. In the posteroanterior exposure the patient should lie on her abdomen, the tube being placed above and the plate below. In the second case, a semilateral or oblique exposure is preferable, the patient occupying either a medium position between lateral and dorsal, or between lateral and ventral.

Furthermore, the author recommends: Compression diaphragm after Albers-Schoenberg with a cylinder of 13 cm. diameter; intensifying screen; medium soft or soft tubes; short exposure during apnea.

Simon, Ludwig, Mannheim: Advantages and Disadvantages of Pyelography. (*Beitr. z. klin. Chir.*, Vol. 95, No. 2, p. 297.)

The author describes the precautionary measures to be observed in filling the renal pelvis with collargol and explains the value of the roentgen picture of the collargol-filled urinary passages in distention of the renal pelvis due to floating kidney, in pyelitis and pyelonephrosis, in renal tuberculosis and certain affections of the deeper urinary passages.

"Summarizing all that the combined methods of endoscopy, collargol-filling and roentgenography can perform, we must admit that we can obtain a clear picture of the size of the renal pelvis, the mode of its extension, the insertion, dilatation and course of the ureters. By means of roentgenography of the collargol-filled renal pelvis we can recognize abnormal cavities of the kidney communicating with the renal pelvis, observe the position of the kidney, and render floating kidneys visible in all their phases. We can also show on the roentgen plate partial dilatation of the urinary passages which allows of the inference of obstacles present, diverticula and abnormal excavations of the bladder."

While admitting that many points, as for instance the dilatation of the renal pelvis, can be correctly diagnosed by ureteral catheterization and cystoscopy, without having resort to collargol and roentgenography, there are certain conditions, as for instance faulty insertion of a ureter, which are impossible to diagnose without pyelography. While further admitting that a floating kidney can be diagnosed without pyelography, the knowledge of a pelvic dilatation of the movable kidney helps to decide the therapy to be instituted. Urinologists, therefore, who assert that pyelography did no more than the other absolutely harmless methods and could be dispensed with, far overshoot the mark. We are too highly indebted to this method for diagnosis and indications to willingly dispense with it, but we also share the opinion of those who say that there are contraindications and that the method should not be employed indiscriminately in all cases. Aside from faultless technic in ureteral catheterization, I would demand as an essential point in the employment of the method that the capacity of the renal pelvis should be previously noted in order to avoid any excess pressure of the fluid, and furthermore urge the greatest care in applying the compression diaphragm. If these precautionary measures are conscientiously observed, pyelography is a method of examination free from danger.

Rieder: Roentgenological Observations in Scrotal Gastrocele. (*Fortschr. a. d. Geb. d. Roentgenstrahlen*, Vol. 23, No. 2.)

The author has observed this rare case for 3½ years. Patient is a 65-year-old man, who developed a hernia on the left side in 1890. It has since continually increased. In 1910 he had almost daily attacks of vertigo without any apparent cause. He seemed to look into a thick fog, compelling him frequently to stop when walking in the streets. Appetite very bad, stool irregular, no vomiting or eructation. In July, 1910, a violent attack of vertigo caused him to fall and become unconscious. Vomited a large quantity of light liquid blood. During the next few days his stool was black, resembling coffee grounds. There were chills. From

now on had almost constantly to lie down, vertigo, headache and chills persisting. Patient had a large scrotal hernia reaching almost to the knee, as shown in photographs. Fluoroscopy, in 1911, showed the stomach to have descended to the region of the symphysis. In subsequent examinations, March, 1913, the stomach had assumed an hourglass shape. The lower part had already entered the hernial sac, forming a sort of balloon, separated from the upper longitudinal part by a narrow constriction in the inguinal canal. The greater part of the contents of this lower gastric sac could be displaced into the upper gastric section by manipulation, but immediately resumed its old position when the digital pressure was released. In December, 1913, it was found that the connective distance in the inguinal canal between the upper and lower gastric parts was narrow and drawn out, and that the prepyloric region in the form of a cone directed toward the hernial aperture evacuated its contents into the duodenum which was still in the peritoneal cavity. Thus, the pylorus was undoubtedly in the inguinal canal at the time. As early as half an hour after ingestion of food, numerous loops of the small intestine were seen to move in the scrotum. Palpation showed that the hernia had advanced to the floor of the scrotum and was completely separated from the testes. Drinking of water or milk caused a gurgling sound on auscultation, and the applied hand could distinctly perceive the inflow of the fluid into the scrotal hernia. By administration of effervescent drinks the gastric part of the hernia was still more distinctly contrasted. At a later period more extensive examinations with bismuth meals were undertaken with the following results:

There was a so-called double hernia, i.e., a hernia of the small intestine combined with a hernia of the large intestine, and complicated besides by a displacement of the stomach. Considering the size of the growth and its voluminous content of intestines, the case may be called one of eventration. The cause of the hernia could not be discovered with certainty, but an abdominal trauma sustained in childhood may have been the exciting cause. The roentgen examination established the fact that four distinctive tubes ran through the inguinal canal:

(1) The downward tract corresponding to the pars media of the stomach.

(2) The upward tract to the duodenum, corresponding to the prepyloric region.

(3) The downward tract of the jejunum.

(4) The tract of the transverse colon running upward again and laterally from the descending gastric canal.

Loeffler, Wilhelm: Alcoholic Polyneuritis with Unilateral Paralysis of the Diaphragm and Vocal Cord. (*Deutsch. med. Wchnschr.*, Vol. 41, No. 44, p. 1038, Oct. 26, 1915.)

The following is a case of polyneuritis with a peculiar localization of the paralysis, the nerves of the left upper half of the body and especially the left phrenicus being chiefly involved.

Patient was 29 years old and drank 4 to 5 liters of beer daily, 1 liter of wine and numerous brandies of all sorts.

Physical Examination.—Patient could not stand without assistance. Left leg paralyzed. Slight flexion in hip and knee very laborious. Bilateral patellar reflex weak, plantar reflexes absent, no Babinski. Shoulder girdle symmetrically innervated. Flexion of left upper arm markedly deficient, right arm not up to normal. Musculature of left forearm atrophic, slight supination possible, extension impossible. Dorsal flexion, abduction and adduction completely arrested. The bent fingers can not be stretched. Biceps and triceps reflexes can hardly be elicited. Diagnosis so far: Combined paralysis of radialis and ulnaris. Electrical examination shows degeneration reaction in the region of the left radialis and in the two peronei. The electrocardiogram showed no peculiarities aside from tachycardia.

Patient's voice was raw and hoarse, and his speech peculiarly broken. Breathing occurred nearly after every word, but without dyspnea, pointing to paralysis of the left recurrens. On account of the mobility of the left pulmonary border in ascent of the diaphragm and slight protrusion of the left hypochondrium at expiration, a diagnosis of paralysis of the left phrenicus was made.

Fluoroscopy.—The "magenblase" (stomach bubble) had ascended about two fingers' width above the level of the right diaphragm. The heart had assumed a rather decided transverse position, so that the apex was very distinctly

seen against the "magenblase." The right half of the diaphragm showed normal copious excursions. On the left side, there was a less extensive paradox displacement, which was seen very beautifully. While the right shadow of the diaphragm descended by about 1½ cm. on respiration, the left diaphragm ascended by about 1 cm. Simultaneously, there was a distinct displacement of the heart and mediastinum to the right. Pressure on the abdomen at the climax of inspiration caused the left diaphragm to ascend still further. Thus there were the signs of a paralysis of the left diaphragm, all of which were explained by the defective contraction of the muscles. A condensation of the pulmonary field over the paralyzed ascended half of the diaphragm such as has recently been described by various authors, could not be observed. Evidently, the tonus of the diaphragm was not sufficient to prevent an appreciable atelectasis of the left lung.

Treatment consisted in withdrawal of alcoholics, pine needle baths with passive movements and massage, electric stimulation of the paralyzed nerves of the extremities. Small doses of natrium salicylicum had been administered in the first few weeks. No local treatment of the phrenicus. The function of the diaphragm was restored spontaneously, and in a relatively short time as compared to the other muscles. The gradual restoration of the function of all affected nerves with the exception of a slight paresis of both peronei justifies the diagnosis of polyneuritis. The favorable course is of particular interest, as generally polyneuritis with involvement of vagus and phrenicus is prognostically unfavorable, the paralysis of the diaphragm being the immediate cause of death in such cases.

SIMON, HERMAN, Breslau: Histology of the Effects of Roentgen Rays on Tumors. (*Beitr. z. klin. Chir.*, Vol. 95, No. 3, p. 555.)

"(1) The effect of roentgen rays and emanations of so-called radioactive substances (radium, mesothorium, etc.) upon the tissue is qualitatively alike on the whole.

"(2) The effect is strictly local and confined to the cells and tissues upon which the rays are directed. There is no distant effect.

"(3) The rays influence the cells direct without the intermediary of the blood or lymph current. The cell contains the nucleus, and the latter presumably the chromatin which undergoes a change in the first place.

"(4) All the cells and tissues are influenced by the rays, but to a very variable extent. The effect depends upon the quantity and length of application of the rays, and on the degree of susceptibility of the cells acted upon."

Tumor tissue undergoes the following histological changes: After a longer or shorter period of latency, the tumor cells and especially their nuclei show enormous hypertrophy and even development of giant cells. The chromatin of the nuclei coagulates, is diffused or sometimes even displaced into the protoplasm. There occur vacuoles, the nucleus is obliterated and nothing is left of the cell but detritus. In the stroma of the tumor, there occurs extensive emigration of white blood corpuscles which, as phagocytes, swallow the detritus. At the same time, a young and vascular connective tissue is formed which gradually replaces the tumor. It does not seem to be an infrequent occurrence for the tumor cell to change its characteristic properties under the influence of the rays, frequently in the sense of a far-reaching differentation, and with it a diminished clinical malignancy.

BABESCH, AUREL A., and SCHERBANESCU, LUCIA, Bukarest: Deformities of the Upper Extremity. (*Spitalul*, 1914, No. 12. Ref.: *Zentralbl. f. Röntgenstrahlen*, Vol. VI, Nos. 7 and 8, p. 266.)

The authors describe two interesting cases of congenital deformities, the etiology of which could not be determined even with the help of roentgenography. In one case, a woman of 26 years, the right radius, the right radial carpal bones, the right thumb and the right metacarpal bones were missing. The lower arm was considerably shortened and bent toward the radial margin. The ulna, too, showed shortening and flexion. The fingers were in permanent flexion and hardly capable of any active movement.

The other case concerns a 7-year old boy with congenital, almost complete amputation of the left first finger and half of the left middle finger. The ring finger was complete but had a deep constriction at the base. It is not impossible that, in this case, there was an

intrauterine constriction from amniotic cords, although the authors are inclined to assume a congenital (intrauterine) syphilitic affection.

Fischer, Heinrich: Motor Processes of the Pathological Stomach. (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, Vol. XXVIII, p. 843. Ref.: *Wien. med. Wchsch.*, Vol. LXVI, No. 2.)

The author calls attention to abnormally exaggerated peristalsis of the stomach followed by prolonged peristaltic rest, which has also been noticed by others. His observations are limited to ten cases, and he looks upon the phenomenon as a symptom of juxtapyloric ulcers which should excite our attention at a time when other clinical symptoms are not yet discernible. He considers it very probable that the time of relaxation is not one of absolute quiet but that, on the contrary, the most extreme peristalsis is observed in those cases where the gastric evacuation meets with considerable difficulties. At periods of relaxation the stomach is probably evacuated by imperceptible waves.

Schur, H., and Plashkes, S.: The Significance of the Function of the Antrum Pylori in Gastric Surgery. (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, Vol. XXVIII, p. 795. Ref.: *Wien. med. Wchsch.*, Vol. LXVI, No. 2.)

The authors have made careful examinations of the gastric juice after operations on the stomach and found that gastro-enterostomy has but little influence on the HCl content and that the acidity is only reduced inasmuch as alkaline intestinal contents enter into the stomach. On the other hand, in resection of the pylorus with gastrojejunostomy (Billroth, II) absence of HCl could nearly always be established. The authors explain this on the assumption that a hormone is formed in the pyloric part of the stomach which incites secretion of HCl in the gastric fundus. The surprising part is that psychic excitation is not sufficient for the production of HCl.

These investigations deserve so much more attention as they agree with the opinion of those surgeons who discard gastro-enterostomy in gastric ulcer and prefer resection of the pylorus. In obstinately recurrent gastric ulcer so far there was no justifiable procedure except Schnitzler's total removal of the HCl-producing part of the fundus. So much more important therefore is the establishment of the fact that the mere removal of the pyloric part may inhibit the secretion of HCl.

Tilton, Benjamin T.: Five Teaspoons Removed from an Intra-abdominal Abscess After Perforating the Small Intestine. (*Med. Rec.*, December 11, 1915, p. 997.)

An Italian, male; 32 years of age, inmate of an insane asylum, was admitted to the hospital ward for abdominal pain and tenderness. During the following week he vomited on a few occasions and took but little nourishment. Evening temperature 101° F. Marked tenderness and rigidity on the right side.

Roentgen examination showed what was thought to be one large spoon.

The patient was operated on, a large, localized peritoneal abscess being found. In the abscess cavity were found five spoons lying one upon another, with the bowls at the level of the cecum and the handles pointing upward. The spoons were perfectly superimposed, lying one upon another. There was a perforation of the jejunum close to the duodenojejunal junction.

The patient related that on one day he had swallowed three teaspoons and nine days later he had swallowed two more, in each instance forcing the spoon down the throat, bowl-end first.

Albers-Schönberg: A Skeletal Anomaly of Atavistic Interest, the Supra-condylar Process (Processus Epicondyloideus). (*Fortschr. a. d. Geb. d. Röntgenstrahlen*, Vol. XXIII, No. 2.)

A 28-year-old woman was medically examined and found to be perfectly healthy. The only abnormality noted was the presence of an apparent exostosis which was located on the median side of the left humerus. The patient knew nothing of its presence. The right arm was free of this condition. Roentgenographic examination revealed a hook-like exostosis on the median side of the humerus about seven centimeters above the elbow joint. The cortical bone at this site is unaltered and the

exostosis shows well-marked bone structure. This process is found in lower forms of mammals, reptiles and amphibious animals. Grashey has reported a similar case.

E. S. B.

ALBERS-SCHÖNBERG: A Rare, Unknown Structural Anomaly of the Skeleton. (*Fortschr. a. d. Geb. d. Röntgenstrahlen*, Vol. XXIII, No. 2.)

The findings in this case report were accidentally discovered in the examination of a healthy soldier of twenty-two years, who complained of pain and swelling of the right shoulder and of the left foot. No pathological changes were seen to involve either the shoulder joint or the joints of the foot. All the bones of the foot and the lower portion of tibia and fibula were seen to have numerous small foci of increased bone density similar to "compact islands" evenly distributed throughout each bone. These are small oblongs in shape, the long axis of each lying parallel with the long axis of the bone it involves. The number of these areas is so great that the bones appear to be sprinkled with them. Some are from four to five centimeters in length, others two to three centimeters. The greater number lie in the spongy portion of the bone, a few in the cortical portion, the diaphyses being practically not involved. They do not lie in the outer layers of the bone, at no place coming to the surface. All of these small areas are sharply defined from the surrounding body tissue. They are particularly numerous in the lower end of the femur and the upper end of the tibia. The patella is not involved, this bone shadowing normal structure. In the upper end of the femur these oblong bodies follow accurately the architectural markings from the shaft into the head. The acetabulum is also involved, the flecks extending for a small distance onto the ilium. The latter is for the most part free from these areas. In the shoulder region there is a similar involvement as noted in the other joints. The epiphysis and the adjoining areas of the diaphysis are studded with these peculiar shadows and are seen to be most numerous at the epiphyseal line. The scapula and clavicle are not involved. In the region of the hand and wrist, these shadows are very prominent and are sprinkled through all the bones from the distal portions of the radius and ulna to the terminal phalanges.

Lues and tuberculosis have been ruled out: the patient's work, enameling, gives no basis in arriving at a diagnosis. Albers-Schönberg believes with Grashey that the condition is due to some disturbance in growth, this being evidenced by the fact that the shadows observed occur mostly on the epiphyses and in their immediate neighborhood.

E. S. B.

JACOBSOHN, WILLIAM: The Causes of Rickets. (*New York Med. Jour.*, Vol. CIII, No. 2, p. 68, January 8, 1916.)

The cause of rickets is an irritant which produces an over-growth of osteo-genetic tissues.

The direct cause of this irritant is unknown at the present time. Although practically all organs are involved the changes produced in the bones are most marked.

For the intelligent interpretation of the *x*-ray findings in rickets, a knowledge of histology and pathology is necessary. The normal growth of bone depends upon the multiplication of cartilage cells in definite lines followed by the calcification of the intercellular spaces for the entrance of blood-vessels with specific absorption of tissues, and the concentric deposition of bone within the medullary spaces.

In rickets, the cartilaginous and subperiosteal cell growth which produces ossification goes on with increased rapidity and in an irregular manner, both between the epiphysis and the diaphysis and beneath the periosteum.

In the zone of proliferation, the cartilaginous cells are not regularly arranged in rows around a definite zone in advance of the ring of ossification as in the normal tissue; but there is an irregular heaping up, sometimes in rows, sometimes not. The medullary spaces are increased in area so as to extend into the zone of calcification and sometimes through it. The deposit of bone tissue within these spaces is either absent, however, or very irregular and is for the most part replaced by a soft, friable substance consisting of bone tissue that is lacking in lime salts; this tissue is called "osteoid."

In the region of ossification (ends of diaphysis and epiphysis) blood-vessels and cartilage cells are increased. Calcification is disturbed or absent. The subperiosteal layers of

cells which are normally thin become thickened. Beneath the periosteum is also to be found the osteoid tissue. In the medulla of the bone mucoid degeneration takes place with resorption of bone.

In convalescence, lime is deposited in the previously limeless osteoid tissue and the result is a thick and heavy bone. In fractures at this period callus formation is excessive.

For the purpose of roentgen study, the pathological changes are classified as follows:

The epiphysis and zone of proliferation.

The outline of cortex and periosteum.

The medullary canal.

The general structure of the bone.

The epiphysis shows the delay in ossification (smaller than for the given age), and a lack of inorganic material in the bone, thus producing an increased radiability.

The zone of proliferation is much less than normal, showing irregular deposits of bone on the epiphyseal side, with a toothed appearance of the diaphysis. The degree of radiability in the zone of proliferation is more like that of cartilage than that of bone. The periosteum shows a definite thickening. The cortex is thinned. The deposit of bone cells is irregular. The medullary cavity is increased. Cystic formation of bone is present at times. Marked deformities sooner or later become apparent. Fractures partial or complete, with little tendency toward callus formation, are frequently present. At points where the strain becomes great, a layer of new bone cells, according to Wolf's law, forms to prevent the bone giving way. This is common in cases of knock knee and bow legs in the lower third of the femur and tibia.

SHATTUCK, GEORGE C.: The Relation of Dullness to Cardiac Outlines. (*Lancet-Clinic*, Vol. CXV, No. 8, p. 166.)

Percussion, as generally employed, consists of a few processes carried on simultaneously. The first is detection of diminished resonance; the second is judgment as to whether or not this change corresponds with the heart border. Accurate weighing or measuring involves no such dual process. It practically eliminates the subjective and the result is almost purely objective. Percussion is largely subjective because judgment is an important factor in the result.

Shattuck, with the collaboration of Drs. Dodd and Holmes, has attempted by teleroentgenography to check ordinary light percussion, using it objectively with reference to sound, disregarding resistance, and abstaining as far as possible from allowing knowledge of anatomy or other evidence to influence the result.

Before making the *x*-ray examination, the outlines of the physical examination were marked with wires stuck to the chest wall with adhesive plaster. The plates were made at mid-respiration. A number of very interesting illustrations are given showing comparative errors of the percussion method. As the result of their studies, Shattuck reaches the following conclusions concerning ordinary percussion:

1. It easily reveals gross abnormality in cardiac dullness to right or left.

2. It may suggest slight abnormalities which must then be confirmed or disproved by other means.

3. When percussion indicates slight cardiac enlargement, or no enlargement, palpation, auscultation, blood pressure, or history may provide further evidence of importance which can be used to check the results of percussion.

4. When doubt still remains, teleroentgenography or the orthodiagraph may be of service; but it should be remembered that variations of heart size are dependent on many factors, and that the average man does not exist. Moreover the errors of these methods in the hands of one who does not appreciate their difficulties when applied to the heart, are large.

5. Percussion is especially unreliable for finding slight enlargement of the aortic arch, for determining the level of the apex and for discovering hypertrophy of the left ventricle when there is little or no dilatation. Palpation in the left lateral position is often helpful for solving the last two problems, and accentuation of the aortic second sound or increase of blood pressure should not pass unobserved.

6. It is not worth while to attempt by ordinary percussion methods to make a silhouette outline of the heart. It is better to note the relation of dullness in terms of interspace and anatomical lines, and to compare the findings with a subjective standard based on experience, than to judge of enlargement by

measurements of ordinary percussion outlines and comparison of them with the orthodiagraphic standards.

7. The attempt to make silhouette outlines of the heart by means of special methods of percussion has shown, in the hands of a few, results which are good, but more or less uncertain.

THE TECHNIC OF RADIUM ADMINISTRATION. (*London Lancet*, Feb. 5, 1916, p. 308.)

This report contains a record of some observations regarding the technic of burying radium tubes in growths and the choice of cases for this treatment. These observations are as follows:

1. Thorough aseptic technic is as necessary as in general surgery, because screened radium does not have a markedly antiseptic effect.

2. Screens containing tubes of radium emanation may be boiled since the internal pressure of the heated tubes is as a rule well below that of the atmosphere. The boiling of tubes containing radium salts is not worth while on account of the risk of breakage.

3. The object in radium treatment is to produce an adequate and even distribution of the rays throughout a tumor. Thus it is usually better to bury a number of weaker tubes in a growth than to employ one strong one for the same purpose.

4. Accurate implacement of a tube in a growth is essential. It usually happens, therefore, that it is better to make a large incision and expose the tumor than to push tubes blindly through a small cut in the skin. It is, moreover, safer.

5. So far it has rarely been found possible to remove a cancer with a single dose. Too big a dose may produce a violent reaction with local necrosis of tissue.

6. The reaction or ulceration after an overdose may last a long time, but never fails to settle down or to heal completely in the long run, with the following exception.

7. A growth treated by radium must be surrounded by or contain an adequate quantity of healthy tissue capable of supplying sufficient assistance for the work of repair, otherwise a permanent malignant ulcer may be formed. It is better to attempt to treat recurrences situated in regions of low vitality by means of externally applied radio-active plates.

8. The quantities of radium and radium emanation which should be used vary according to the size of the growth, the thickness of the screen employed, and the situation of the tumor. Some malignant growths appear to need larger doses per cubic centimeter than others. If we could find out exactly the amount of radiation therapeutically needed per cubic centimeter of a tumor, and an accurate method of estimating the size of the cancer growths, there would merely be left to the physicist a mathematical calculation of the quantities to be used to produce total absorption, and the use of a sufficient number of tubes would remove the possibility of local overdose.

9. In the treatment of malignant glands of the neck careful attention should be given to the toilet of the mouth. The presence of carious teeth may lead to septic infection of glands with definite abscess formation when the radium tube is introduced.

CASE, JAMES T., M.D., Battle Creek, Mich.: The Value of Roentgen Ray Examination in the Diagnosis of Gastric Cancer. (*International Clinics*, Vol. 1, Series 25, 1915.)

The normal indentations of the stomach are given by Case as follows:

(a) The splenic notch, usually present at the upper border of the greater curvature, due to the pressure of the spleen against the greater curvature. One may judge thereby as to the size of the spleen.

(b) The changes in shape of the stomach shadow produced by the peristaltic waves are varying, but characteristic, and are easily recognized under the fluorescent screen or by a series of roentgenograms.

(c) The pyloric sulcus, the break between the shadow of the stomach and the shadow of the first portion of the duodenum (variously termed bulbus duodeni, duodenal bulb, stomach cap, pileus ventriculi), normally about one centimeter in width.

Excluding these normal indentations in the shadow of the stomach, any defect in the shadow must be regarded as suspicious of malignancy, and its identity determined.

Holzknecht grouped a number of radiologic and clinical signs under various heads, each one a "symptom-complex." The following

symptom-complex relates to gastric carcinoma:

"1. Bismuth residue six hours after the Rieder meal.

"2. Normal shadow of the stomach seen on the screen.

"3. Achylia.

"Diagnosis: A small carcinoma of the pylorus."

In the symptom-complex noted above the reasoning is as follows: (1) Achylia is always associated with hypermotility so long as the pylorus is free, the stomach emptying in two or three hours; (2) therefore, a residue after six hours must mean an organic obstruction, because (3) spasm of the pylorus is never associated with achylia, but with hyperacidity.

Case refers to the symptom-complex of Holzknecht only to warn against its unreliability, for, he says, while it is true that in a certain number of cases such reasoning might lead to the recognition of an early pyloric neoplasm, the same reasoning in many other cases will lead to ignominious failure. He has seen cases fitting perfectly into the above symptom-complex which at operation proved to be not malignant, but due to adhesions, bands, pressure of extraventricular masses or gall stones, and sometimes no pathology at all could be demonstrated at operation.

The author does not presume to state that carcinoma of the stomach could not exist in a lesion too small for detection by carefully conducted roentgenographic search, but still not a single case of carcinoma of the stomach, to his knowledge, has been revealed at operation where previous roentgen examination had failed to show an organic lesion. The gross filling defect produced by a tumor of the lower half of the stomach on the greater or lesser curvature is usually obvious. The characteristics are as follows:

1. Permanence. The filling defect is of the same size, in the same location, and of the same identical shape and outline at the various observations.

2. The filling defect usually coincides with a point of tenderness on pressure, or, if the entire epigastrium be tender, with the point of most marked localized pressure-pain. The absence of pain-point does not at all negative the seriousness of a filling defect.

3. Screen examination as well as serial plate examination will show that the peristaltic waves fade out as they reach the region of the filling defect; and, provided it is not too near the pylorus, the waves reappear beyond the defect, proceeding to the pylorus. An inflammatory mass associated with ulcer may give rise to this same phenomenon.

4. When the lesion is near the pylorus, even though not directly producing stenosis, antiperistaltic waves may be observed.

These are seldom recognized on plate examination, but if repeated fluoroscopic observations are made, at some time or other, in every case of organic pyloric obstruction, antiperistaltic waves are likely to be observed; when seen they are pathognomonic of an organic lesion. Here again the evidence does not necessarily speak for malignancy, but with a filling defect antiperistalsis is exceedingly suggestive of malignancy.

5. Unless there exists actual mechanical obstruction due to narrowing of the lumen of the stomach, there is usually early clearance of the stomach contents in a manner characteristic of achylia. This is a point in the differential diagnosis between benign and malignant hourglass stomach. In ulcer cases the emptying time of the stomach is usually normal or even prolonged.

The determination of the extent of a gastric tumor and the probability of adhesions to neighboring organs, as well as the identification of pain-points on pressure, can be accomplished satisfactorily only by palpation under the fluorescent screen.

Symptoms of esophageal obstruction are frequently found in cases of gastric carcinoma.

The author urges the importance of making a complete gastro-intestinal roentgen examination in every case of suspected carcinoma of the stomach, in order to rule out, if possible, extension to or metastatic involvement of other organs. The finding of metastases, especially those occurring in the pouch of Douglas, may permit a differentiation between filling defects due to ulcer.

In differentiating between benign cicatricial stenosis of the pylorus and stenosis due to malignancy, the author has found it of especial value to make the screen and plate examination with the patient lying on the right side, the tube behind the patient, and the screen or plate held vertically against the abdomen.

Extraventricular tumors, unless intimately

adherent to the stomach, may be differentiated through the fact that the normal gastric peristalsis is not interfered with. This is best determined by fluoroscopy, although numerous plates may afford the same information.

Although it is obvious that a very small malignant lesion on the anterior or posterior wall might escape observation, nevertheless a carcinoma of the stomach may almost positively be ruled out in patients whose symptoms are of long standing, but whose stomach is roentgenologically normal. Even in cases where the roentgen ray examination is not required to establish an already obvious diagnosis of malignancy, it renders great aid in locating the lesion and in showing its size and extension to neighboring tissues. At times the roentgen ray evidence will demonstrate that a carcinoma is small, free from adhesions, and distinctly operable in a case which, clinically, presents such signs as would lead one to expect a large inoperable lesion.

CALDWELL, CAPTAIN J. R., R.A.M.C.: **Extraction of Foreign Bodies.** (*The British Medical Journal*, Aug. 28, 1915, No. 2852, p. 322.)

Diagram 1 represents a section of a patient lying on a couch. The roentgen ray tube is in position under the table, while above is the screen. The essential of localization resolves itself into a geometrical calculation—we know the distance of the anticathode of the tube from the surface of the patient's body. We shift the position of the tube a known distance, and we note the apparent distance traversed by the foreign body on the screen. Given these three measurements, it is obvious that the extent of the movement of the shadow on the screen will depend absolutely on the depth of the foreign body. The nearer the projectile is to the screen the less will be its apparent movement.

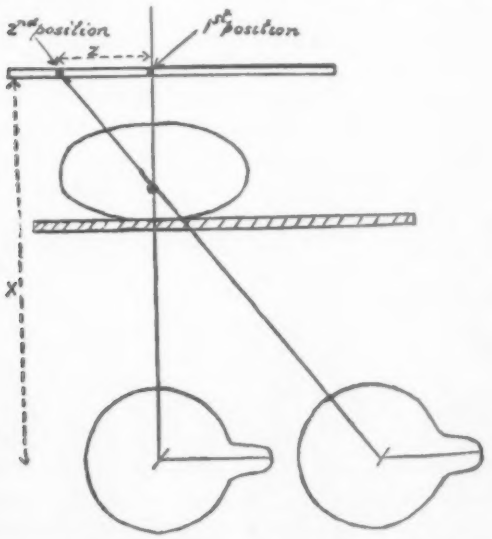

FIG. 1.—Scheme of general arrangement (see text).

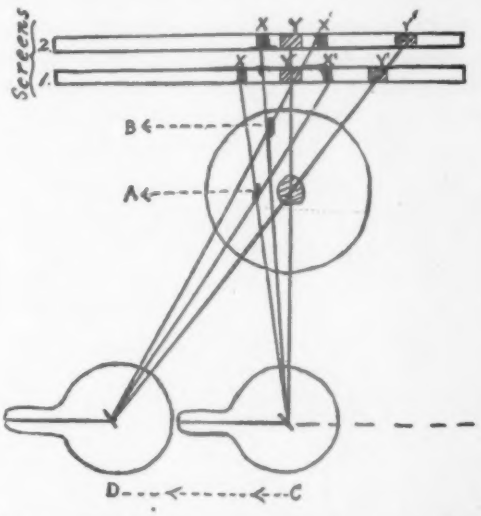

FIG. 2.—The diagram represents, say, a section of a thigh with two foreign bodies, one, A, in the same lateral plane as the bone, the other, B, anterior to it. Two screens, for the sake of simplicity, are shown. On moving the tube from C to D the foreign body A apparently moves the same distance as the bone ($x-x'=y-y'$) (screen 1). The foreign body B makes a smaller apparent movement ($x-x'=y-y'$) (screen 2.)

A glance at Fig. 2 will show that if a foreign body is in the same lateral plane as the shaft of some long bone, its rate of apparent movement upon shifting the source of illumination will be similar to that of the bone. A foreign body anterior to the bone will move less, and when under the skin will scarcely move at all. On the other hand, when the projectile is situated in a plane posterior to that of the bone the conditions are the opposite of those just described.

DEPARTMENT OF BOOK REVIEWS

EDITOR, EDWARD H. SKINNER, M.D., KANSAS CITY, MO.

THE AMERICAN ATLAS OF STEREOROENTGENOLOGY. A Quarterly. Edited and Published under the Sole Auspices of THE NEW YORK ROENTGEN SOCIETY. Editors: Leopold Jaches, M.D., William H. Stewart, M.D., H. M. Imboden, M.D., with Associates and Correspondents throughout the World. The Southworth Company, Troy, New York. Vol. 1, No. 1. Price, $10.00 per year.

We welcome this new product of the New York Roentgen Society and commend their enterprise in bringing the advantages of Stereoroentgenography so convincingly and attractively to the attention of the profession. This loose-leaf quarterly is really a work of art. If the succeeding issues of this quarterly maintain such a beautiful appearance it will surely become the Edition de Luxe of roentgen literature. In appearance it is a repetition of the Stereo-Clinics which Case produced upon the Gastro-Intestinal Tract and Dunham's classic upon Stereoroentgenography of Pulmonary Tuberculosis. There are three articles and eight case histories with stereoroentgen records attached. Caldwell writes convincingly upon "Why the Stereoscope." The other articles are by MacKee upon "Dental Stereoroentgenograms" and Case upon "Diverticula of the Colon." The case histories are as follows: Fracture of the Skull; William H. Stewart, M.D.: Brain Tumor; Leopold Jaches, M.D.: Congenital Stricture of the Œsophagus; Wm. H. Stewart, M.D.: Diverticulum of Œsophagus caused by Osteo-Myelitis of Cervical Vertebræ; H. M. Imoden, M.D.: Multiple Diverticula of the Colon; James T. Case, M.D.: Chronic Appendicitis; H. M. Imboden, M.D. Comminuted Fracture of the Right Elbow; Leopold Jaches, M.D.: Stone in Redundant Ureter; Leon Theodore LeWald, M.D.: Thymus Death; F. M. Law, M.D.

We cannot admit that there is much that is distinctly new with the possible exception of McKee's contribution upon Stereoscopic Dental Roentgenology and this is rather an acknowledgment of the value of what was considered a crude method of making dental stereos. The Brain Tumor case reported by Jaches is a good case history with illuminating roentgen records. The case reported by Imboden as "Diverticulum of Œsophagus caused by Osteo-Myelitis of Cervical Vertebræ" possibly will arouse some comment as to the correctness of the interpretation as what Imboden indicates as the diverticulum seems to be immediately in the location of the recessus pyriformis.

We must congratulate the publishers upon the neat appearance of this quarterly. It is a pleasure to handle a book like this. The reproductions have great sharpness and stereo beautifully. We trust it will secure the support it deserves. The New York Roentgen Society is surely establishing a precedent in this unique contribution to roentgen literature which other individual Societies will find it difficult to surpass.

VADEMEKUM FUER DIE VERWENDUNG DER ROENTGENSTRAHLEN UND DES DISTRAKTIONSKLAMMER-VERFAHRENS IN UND NACH DEM KRIEGE. Von Prof. Dr. Hackenbruch und Ingenieur W. Berger. Mit 117 Abbildungen im Text. Leipzig. Otto Nemnich. 1915. Price, M. 6.20.

This small volume is a roentgen primer for assistants engaged in war hospitals and it also carries as an appendix an elaborate exposition of the forcible extension clamps which Hackenbruch brought to our attention as early as 1912. The author contributed an illustrated article upon his invention to the London *Lancet*, March 14, 1914. Evidently this apparatus has found great favor in war injuries as open wounds and fractures of the long bones can be successfully splinted, thus permitting an otherwise bedfast patient to become ambulant. These extension clamps are adjustable metal affairs which are applied by means of divided plaster casts and permit all manner of changes in degree of extension and even lateral mobility of the fragments if the succeeding

roentgen examination suggest changes. This is a distinct advantage over the usual metal or plaster bridge over the wound in the limb. This clever device is worth while looking into especially if war preparedness extends into the intimate details of the future surgical care of large numbers of injured troops. It seems to be universally applicable in all fractures, both simple and compound, of the long bones. We wonder why surgical literature has not carried more articles upon the possibilities of this apparatus in civil practice.

KOMPENDIUM DER ROENTGENAUFNAHME UND ROENTGENDURCHLEUCHTUNG. Von Ingenieur Friedrich Dessauer, Direktor der Veifa-Werke in Frankfurt am Main, und Dr. med. B. Wiesner, Praktischer Arzt in Aschaffenburg. Zweite vollstaendig umgearbeitete Auflage. In zwei Baenden. Leipzig. Otto Nemnich. 1915. Price, 34 m.

These two volumes engage the most intimate details of roentgen technique. There is absolutely nothing upon interpretation or therapy, simply technique in the most violent German style. These would be splendid volumes to hand a neophyte who thinks that the making of a roentgen diagnosis consists in adjusting a plate and snapping a switch. One is reminded of Brander Matthews' definition of a highbrow as being "one who is educated beyond his intelligence." Dessauer and Wiesner have given roentgenology such a grotesquely intricate exposition that few roentgenologists would recognize their favorite child. Let us hope that no Board of Examiners chooses this book as a source of questions to the poor candidate who has been trained in an American College. We have always relished the word "tome" as a synonym for a learned book not understandable to the average mind. This is one time when the word can be conscientiously applied. No doubt it is essential that the roentgenologist become versed in the principles of his specialty, but there are certain limits to which we demand that only the physicist go. We would therefore like to dedicate the printed pages to the physicist and the pictures to the roentgenologist. Because there really are lots of good ideas upon position and simple apparatus for maintaining the parts comfortably and restfully. At the same time one must realize that while many of the positions recommended are easy for a well person to assume for illustrative purposes, one cannot always place the painful limb of a sick patient in the ideal position. We are willing to grant that this book is the product of a scientific German author without great practical experience.

THE CLINICS OF JOHN B. MURPHY, M.D. Vol. V. Number 1, February, 1916. Octavo of 194 pages, 33 illustrations. W. B. Saunders Company. Published Bi-Monthly. Price per year: Paper, $8.00. Cloth, $12.00.

Every issue of Murphy's Clinics contains something of interest to roentgenologists. Not that there is so much of educational value in Murphy's roentgen interpretations, for he fails to read much of the obvious into his negatives and injects many things which are rather the result of extensive clinical observation. It is for this latter quality that we intend to call our readers' attention to Murphy's Clinics at regular intervals. Clinical observation and insight are qualities which the *x*-ray man should develop and encourage. The whole story of any case is not in the clinical history alone nor the *x*-ray alone, but in the combination impartially of all diagnostic methods. It is notorious that Murphy remarks: "Let the patient's story of his case make the diagnosis." And it is wonderful to watch Murphy reason out the diagnosis from the recorded history and the patient's own story. This faculty is what makes Murphy's Clinic the Mecca that it is. But it would benefit his audience of readers and spectators greatly if he would encourage and demand a higher type of roentgen interpretation in addition. The members of the A. R. R. S. realize the advantages of the annual lantern slide and plate exhibit when the histories of the cases are carefully considered. Murphy's Clinics can serve a similar purpose throughout the year for many rare cases find their way to Murphy and are satisfactorily recorded, and what Murphy may minimize or omit in the *x*-ray interpretation need not be held against the worthy qualities of his clinic.

Among the interesting cases in the Febru-

ary issue we would call attention to a Congenital Cyst of the Neck with complete *x*-ray findings and a preference for *x*-ray treatment. There are several abdominal cases with no roentgen records. It would seem from a reading of the histories that a roentgen analysis of these abdomens would have relieved Murphy of listing these operations as exploratory.

The remaining major portion records bone and joint cases with comment of great educational value. No doubt all of these cases had roentgen examinations, but the printed notes do not disclose such facts.

Of course, we must realize that these bimonthly records of Murphy's Clinics are distinctly surgical and where the capacity for diagnostic analysis is monumental we must not expect the roentgen records to assume more than a pictorial position. At the same time it is probably not immodest presumption on the part of a roentgenologist who reviews this book to expect to find the roentgen ray accorded its just dues.

ROENTGEN-STERILIZATION OF THE CRIMINAL AND INSANE. (Unfruchtbarmachung durch Roentgenstrahlen bei Verbrechern und Geisteskranken.) By Manfred Fraenkel, M.D., Pub. Dr. P. Langenscheidt.

One way of wasting good money is to buy a book that does not live up to its title. This book is one of them. While the center-back of the cover reads: "Dr. Fraenkel, Sterilization," the front cover and the advertising of the publisher announce "Unfruchtbarmachung durch Roentgenstrahlen," which admits of the two meanings "Sterilization by (or through) Roentgen Rays" and "Roentgen Rays Causing Sterility." But if the roentgenologist allows himself to infer that the author will deal with the dangers of sterility connected with his profession, he will find on the title page, which is separated from the cover by devious advertisements, that the sterilization is to be applied to the criminal and insane. But the worst is yet to come. Of the 159 pages of the book, about 149 do not contain a word on the subject, but deal profusely with nauseating details of sexually perverse, immoral and criminal acts. In the remaining ten pages, scattered at intervals, castration and venesectomy and roentgen sterilization are demanded to prevent degenerates from procreating offspring; animal experiments are detailed to prove the destructive effect of the rays on the genitals; two cured cases of dysmenorrhea are cited, and after the successful roentgen treatment of a woman of 51 years of age the attending physician states that "it is certain that abnormal sexual desire loses itself when the ovaries are atrophied." The author further mentions in these ten pages that the rays have an injurious effect on roentgenologists, a favorable effect on the enlarged prostate and may effect temporary sterilization in pathological conditions (tuberculosis, etc.)—all of which has nothing to do with the sterilization of criminals and insane. Considering that the book is devoted to the latter, it sounds strange to hear the author advocate roentgen sterilization in preference to castration on account of the advantage of controlling the effect so that persons need not be made absolutely, but only weakly or temporarily sterile. In view of the illogical contents and the threefold title, it is difficult to say to what class of readers the book is intended to cater, but it certainly contains nothing to increase the knowledge of the physician, while the unsavory part of its contents can only appeal to that part of the populace to whom a weak or temporary sterilization will not do the least good.

H. R.

In the last issue of *The American Journal of Roentgenology*, we omitted to say that "Radium, X-Rays and the Living Cell," by Colwell and Russ, is published by the Macmillan Company, New York, and costs $4.00 net.